Red Snapper
Individual Fishing Quota Program
5-year Review

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Abbreviations

AHRS-AP	Ad Hoc Red Snapper Advisory Panel
CPUE	Catch per unit effort
EOY	End of year
DWH	Deepwater Horizon (oil spill)
F	Instantaneous fishing mortality rate
FAQ	Frequently asked questions
FMP	Fishery management plan
FWC	Florida Fish and Wildlife Conservation
Gulf Council	Gulf of Mexico Fishery Management Council
Gulf	Gulf of Mexico
GT-IFQ	Grouper-Tilefish Individual Fishing Quota
HHI	Herfindahl-Hirschman Index
IFQ	Individual fishing quota
ITQ	Individual transferable quota
JEA	Joint enforcement agreement
LAP	Limited access privilege
LKE	Lowest known entity
Magnuson-Stevens Act	Magnuson-Stevens Fishery Conservation and Management Act
MSY	Maximum sustainable yield
NGO	Non-governmental organization
NMFS	National Marine Fisheries Service
OLE	Office of law enforcement
OY	Optimum yield
PIN	Personal identification number
Reef Fish FMP	Fishery Management Plan for Reef Fish Resource of the Gulf
RQ	Regional quotient
RS-IFQ	Red Snapper Individual Fishing Quota
SESSC	Socioeconomic science and statistical committee
SEDAR	Southeast Data, Assessment, and Review
SERO	Southeast Regional Office, NMFS
SEFSC	Southeast Fisheries Science Center, NMFS
TAC	Total allowable catch
TL	Total length
USCG	United States Coast Guard
VMS	Vessel monitoring system

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Executive Summary

This review evaluates the progress of the Red Snapper Individual Fishing Quota (RS-IFQ) program towards achieving the stated goals of reducing overcapacity and eliminating the problems associated with derby fishing. According to the Magnuson-Stevens Act, a formal and detailed review is required 5 years after the implementation of the program and thereafter no less than once every 7 years. To analyze the program's progress data was obtained from a variety of sources, particularly the RS-IFQ database and annual report, the Southeast Fisheries Science Center's coastal logbook, accumulated landings system, and reef fish observer programs, the National Institute of Occupational Safety and Health, various economic surveys, and surveys of RS-IFQ participants. Analysis of the program was split into six main outcomes or impacts: socioeconomic outcomes, biological outcomes, social impacts, community impacts, safety at sea, and program enforcement. In addition, this review highlights administrative changes to the program, future research needs, and recommended changes to the program. Recommended changes originated from multiple sources, including but not limited to, the Ad Hoc Red Snapper IFQ 5-year Review Advisory Panel, Socioeconomic Science and Statistical Committee, IFQ administrative staff, and industry representatives. The performance of the program, with regards to each component analyzed, can be found in the Review Summary and Conclusions section. In general, the program has been moderately to highly successful in achieving its stated goals, although there is still room for further achievement, particularly with respect the overcapacity, discard mortality, price reporting, and social and community impacts.

1.0 Introduction

This review is intended to evaluate progress made in meeting the goals of the Red Snapper Individual Fishing Quota (RS-IFQ) program. The review does not attempt to comprehensively evaluate management of the reef fish fishery or the entire red snapper segment of the reef fish fishery. The Gulf of Mexico Fishery Management Council (Gulf Council) is required by law to review the RS-IFQ program every five years. The review provides a historical overview of the commercial red snapper sector before and after RS-IFQ implementation, discusses social, economic, and biological trends as they relate to RS-IFQ management, and offers conclusions and recommended changes to the program based on this review. Data and information contained in this report were obtained from a variety of sources, including, but not limited to peer-reviewed literature, the RS-IFQ online data collection system, the Southeast Fisheries Science Center (SEFSC) reef fish observer program, the SEFSC coastal logbook program, SEFSC accumulated landings system, National Institute of Occupational Safety and Health, various economic studies, and surveys of RS-IFQ participants. This report constitutes the findings of the Gulf Council and their comprehensive review of the RS-IFQ program.

1.1 Pre-RS-IFQ Stock Status and Management History

The Gulf of Mexico (Gulf) red snapper stock was first assessed in 1988 and was determined to be overfished and undergoing overfishing (Goodyear 1988). Despite implementation of numerous management measures to restrict harvest and reduce fishing mortality, the stock has remained overfished whereas overfishing ended in 2009. Historical management of the stock has been limited by the need to balance both biological and economic/social consequences of management. Several additional stock assessments were completed from 1990-2012 (Table 1), but rebuilding the red snapper stock was complicated by juvenile red snapper mortality associated with shrimp trawls, and directed and discard mortality from the commercial and recreational sectors. Although the 2005 stock assessment concluded the stock was still overfished and experiencing overfishing, the stock showed small increases in spawning stock biomass (SEDAR 7 2005). The Gulf Council revised the red snapper rebuilding plan in 2007 to address the findings of the stock assessment and end overfishing (GMFMC 2006). Quotas were reduced, the commercial size limit was lowered, shrimp trawl bycatch reduction targets were specified, and the recreational bag limit was reduced. The 2009 stock assessment (SEDAR 7 Update 2009) projections indicated that overfishing would end in 2009 or 2010. Since the revised rebuilding plan was implemented, spawning stock biomass has increased as lower fishing mortality rates allow more fish to survive to older ages. Increases in spawning stock biomass have allowed the Gulf Council to increase annual catch limits for red snapper in 2010, 2011, 2012, and 2013 (Table 2).

The management of the Gulf red snapper stock began in 1984 with the implementation of the fishery management plan (FMP) for reef fish (Table 2). At this time, there was no attempt to limit the harvest of red snapper. Due to the 1988 and subsequent Gulf red snapper stock assessments, regulatory amendments and FMP amendments were implemented to manage the stock (Table 2). Quotas, limited access fishing permits, trip limits, and closed seasons were the primary management tools used to constrain commercial harvest and effort prior to the RS-IFQ program (Table 2). Despite these management measures, the commercial red snapper sector was

overcapitalized, resulting in increasingly restrictive regulations. The first red snapper commercial quota was established in 1990 at 2.79 million pounds (mp) gutted weight. The commercial quota was subsequently reduced in 1991 and 1992 to 1.84 mp, but then increased to 2.76 mp from 1993-1995. In 1996, the quota nearly doubled to 4.19 mp and remained at this level until the start of the RS-IFQ program in 2007. In 1992, a moratorium was placed on issuing new Gulf reef fish permits, which were required to harvest reef fish species (including red snapper), and a new red snapper endorsement was created, allowing for a 2,000 lb red snapper trip limit. Reef fish permit holders without the endorsement could harvest 200 lb of red snapper per trip. By 1998, permanent red snapper Class 1 and Class 2 licenses were created based on the endorsement (Class 1) or 200 lb trip limit (Class 2). Class 1 licenses (2,000 lb trip limit) were established for fishermen directly targeting red snapper, and were issued to an income-qualifying owner or operator that had a commercial reef fish permit with a red snapper endorsement on March 1, 1997 or to qualifying historical captains. Class 2 licenses were established as a "bycatch" license allowing fishermen to keep red snapper incidentally caught during the red snapper season openings. Class 2 licenses were issued to the income-qualifying owner or operator that had a commercial reef fish permit on March 1, 1997 and had recorded landings of red snapper between January 1, 1990 and March 1, 1997. Any red snapper caught in excess of the applicable trip limit had to be discarded and red snapper could not be retained during monthly fixed closed seasons.

Prior to 1991, commercial fishermen could fish year-round for red snapper. The number of days open to red snapper harvest decreased as fishermen increasingly met the quota in a shorter period of time. By 1995, the red snapper commercial season was only open for 52 days (Table 2). In 1996, the red snapper quota was split into spring and fall seasons. In the following years, in an effort to extend the season, red snapper could only be harvested during a designated time period each month (first 10 or 15 days). Overcapitalization, combined with lengthy seasonal closures, resulted in derby-style fishing conditions as fishermen raced to catch quota before the fishing season closed. Derby-style fishing led to unsafe fishing conditions, market gluts resulting in depressed ex-vessel prices, high bycatch and discard mortality rates, and reduced regulatory compliance. The RS-IFQ program was implemented to address these and other problems, including chronic overfishing.

1.2 RS-IFQ Development, Design, and Structure

An Individual Fishing Quota (IFQ) program for red snapper was first proposed in Amendment 8 to the Fishery Management Plan for Reef Fish Resources of the Gulf (Reef Fish FMP) and approved by the National Marine Fisheries Service (NMFS) in 1995. The program was not implemented due to Congressional action that placed a moratorium on the development and implementation of new Individual Transferable Quota (ITQ) programs until October 1, 2000. Despite this moratorium, red snapper commercial fishermen and the Gulf Council remained interested in developing an IFQ program, and in 2004 initiated the development of the current RS-IFQ program (Figure 1). A majority of eligible voters (based on a weighted majority of votes of red snapper Class 1 license holders) supported, through referendum, development of the RS-IFQ program. Persons eligible to vote in the referendum included red snapper Class 1 license holders, vessel captains harvesting red snapper in 1993-1996, and certain lessees of Class 1 licenses. NMFS issued 157 referendum ballots, 145 of which were filed with the agency. The

weighted vote resulted in 72% of respondents (representing 81% of the weighted votes) encouraging the Gulf Council to consider an IFQ program. During 2004 and 2005, the Gulf Council, in collaboration with the Ad Hoc Red Snapper Advisory Panel (AHRS-AP), developed Amendment 26 to the Reef Fish FMP (GMFMC 2006). This amendment outlined the key components of the RS-IFQ program. In 2006, a second referendum determined that a majority of eligible voters supported the submission of Amendment 26 to the Secretary of Commerce for approval. On January 17, 2006, NMFS issued 167 second referendum ballots, 140 of which were filed with the agency; the weighted vote demonstrated 76% of respondents (representing 87% of the weighted vote) favored implementation of an IFQ program. The amendment was approved by the Gulf Council in March 2006 and implemented by the Secretary of Commerce on January 1, 2007.

Initial shares were issued to Gulf reef fish permit holders with valid Class 1 or Class 2 red snapper licenses on November 22, 2006, based on the amount of red snapper landings reported under each entity's qualifying license during the qualifying time period. For Class 1 license holders, RS-IFQ shares were based on the best ten consecutive years from 1990-2004. For Class 1 historical captain license holders, RS-IFQ shares were based on seven years of landings from 1998-2004. For Class 2 license holders, RS-IFQ shares were based on the best five years of landings from 1998-2004. As initial share distribution was based on landings history, Class 1 license holders receiving a majority of the RS-IFQ shares (91%) and corresponding allocation. Class 2 license holders and fishermen along the west Florida shelf received smaller amounts of shares and corresponding allocation, as red snapper were less plentiful there during the qualifying years of the RS-IFQ program.

In 2010, there were significant changes made to the RS-IFQ database and online system (Figure 1) to align it with the Grouper-Tilefish IFQ (GT-IFQ) program and enhance law enforcement. In 2010, the structure switched from a fisherman-assignee based system to a fisherman-vessel based system. In the old system, a unique entity could have multiple accounts (one for each vessel owned), but the new system switched to one account per unique entity and allowed multiple vessels per shareholder account. Additional changes to the program included submission of share transfers electronically, estimation of gutted fish weights for landing notifications, requiring preapproval of landing locations, and the elimination of vessel endorsements. All analyses in this review are based on the 2010 system, with one account per unique entity.

On June 1, 2011(Figure 1), actual ex-vessel price was redefined to ensure equivalent reporting among dealers. The definition now states that "actual ex-vessel price" represents the price paid per pound of fish before any deductions are made for transferred (leased) allocation (i.e., pounds of fish) and goods and/or services (e.g., bait, ice, fuel, repairs, machinery replacement).

The RS-IFQ program is a single-species, one share category program. Participants must obtain a RS-IFQ account and all transactions (share and allocation transfers, landings, and cost recovery fee payments) are completed online. For the first five years of the program (2007-2011), anyone who possessed a valid Gulf commercial reef fish dealer permit or Gulf reef fish permit was eligible to participate in the program. Beginning January 1, 2012, all U.S. citizens and permanent resident aliens became eligible to obtain a RS-IFQ account to purchase red snapper

shares and allocation. Only accounts with allocation and a valid Gulf reef fish permit are allowed to harvest red snapper.

There are three main account roles in the RS-IFQ system: dealer, shareholder, and vessel accounts. All accounts are assigned based on the unique entity (single or combination of individuals and/or corporations) that held either a Gulf dealer or Gulf reef fish permit. Prior to January 1, 2012, shareholder accounts with valid Gulf reef fish permits were able to purchase and sell both red snapper shares and allocation and harvest red snapper. Shareholder accounts without a valid Gulf reef fish permit could only sell shares and allocation. After January 1, 2012, any U.S. citizen or permanent resident alien can obtain an IFQ account to purchase or sell red snapper shares and allocation. A valid Gulf reef fish permit is still required to harvest red snapper. Shareholder accounts can be further classified as those that hold shares and allocation, and those that only hold allocation. Vessel accounts are associated with shareholder accounts and are used to debit landings at the time of dealer transactions. Shareholders must maintain sufficient allocation in vessel accounts to land red snapper. Shareholder accounts may have multiple vessel accounts. A list of current RS-IFQ accounts with red snapper shares is available on the SERO website. Dealer accounts are limited to completing landing transactions and paying cost recovery fees.

Shares are a percentage of the red snapper commercial quota, whereas allocation refers to the actual poundage that is possessed, landed, or sold during a given calendar year. At the beginning of each year, allocation is distributed based on the annual quota and the share percentage held by a RS-IFQ account. Allocation can then be used to harvest red snapper or transferred to another valid shareholder account. Adjustments in quota can occur if the status of a stock changes as a result of new assessments or through the reallocation of quota between commercial and recreational fishing sectors. Adjustments in a quota are distributed proportionately among shareholder accounts based on the percentage of shares each account holds at the time of the adjustment. If an RS-IFQ shareholder's Gulf reef fish permit has been permanently revoked, at the beginning of the next fishing year, the Regional Administrator for NMFS will redistribute the shares held by that shareholder proportionately among remaining eligible shareholders based upon the amount of shares each held just prior to the redistribution.

The RS-IFQ program has a built-in flexibility measure to allow a once-per-year allocation overage for any RS-IFQ account that owns shares. For these accounts, a vessel can land 10% more than the remaining allocation on the vessel once per year. This overage is then deducted from the shareholder's allocation for the next fishing year. Because overages need to be deducted in the following year, RS-IFQ accounts without shares cannot land an excess of their remaining allocation and RS-IFQ accounts are prohibited from selling shares that would reduce their shareholdings below the amount needed to repay the overage in the following year.

The Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act) requires fishery managers to ensure that no single catch share participant acquires an excessive share of the quota. The RS-IFQ program is monitored to prevent an individual entity from obtaining shares in excess of the established share cap. The RS-IFQ program share cap of 6.0203% was based on the maximum RS-IFQ share issued to a person, corporation, or other

entity at the time of initial apportionment. There is no allocation cap for red snapper and there are no government fees associated with any share or allocation transfer.

When harvesting red snapper, vessels are required to have a Gulf reef fish permit and to notify NMFS before leaving port ("hail out"). While at-sea, vessels are monitored using vessel monitoring systems (VMS). When returning to port, vessels landing red snapper must provide an advance landing notification (3-12 hours prior to landing) indicating the landing time and location, the intended dealer, and the estimated pounds landed. Landing may occur at any time but fish may not be offloaded between 6 p.m. and 6 a.m. A landing transaction report is completed by the RS-IFQ dealer and validated by the fisherman. The landing transaction includes the date, time, and location of transaction; weight and actual ex-vessel value of fish landed and sold; and the identity of shareholder account, vessel, and dealer. All landings data are updated on a real-time basis as landing transactions are processed.

NMFS computes the total value of the red snapper commercial sector through the collection of ex-vessel prices. Ex-vessel prices are the prices paid by a dealer per pound of fish. All RS-IFQ fishermen are charged a cost recovery fee to recover costs required to administer, manage, and enforce the RS-IFQ program. The cost recovery fee is 3% of the ex-vessel value of the landed fish, and may be re-evaluated and changed if costs of administering and enforcing the program are less than costs recovered. RS-IFQ dealers are responsible for collecting the cost recovery fee from fisherman at the time of each sales transaction and submitting fees to NMFS on a quarterly basis.

Complete regulations governing the RS-IFQ program can be found at 50 CFR 622.16 (http://www.gpo.gov/fdsys/pkg/CFR-2011-title50-vol10/pdf/CFR-2011-title50-vol10-chapVI.pdf). The RS-IFQ program is managed with the IFQ online data collection system, which can be accessed at: https://ifq.sero.nmfs.noaa.gov/. RS-IFQ fishermen and dealers log into and manage their online accounts through the website. Important information regarding the RS-IFQ program is available for download on the website and provides updated information regarding the program's components and regulations.

1.3 RS-IFQ Program Goals and Objectives

The purpose of the RS-IFQ program, as discussed in Amendment 26 to the Reef Fish FMP was "to reduce overcapacity in the commercial fishery and to eliminate, to the extent possible, the problems associated with derby fishing, in order to assist the (Gulf) Council in achieving [optimum yield]. (GMFMC 2006)" Optimum yield is defined in the Magnuson-Stevens Act as "the amount of fish which-- (A) will provide the greatest overall benefit to the Nation, particularly with respect to food production and recreational opportunities, and taking into account the protection of marine ecosystems; (B) is prescribed as such on the basis of the maximum sustainable yield from the fishery, as reduced by any relevant economic, social, or ecological factor; and (C) in the case of an overfished fishery, provides for rebuilding to a level consistent with producing the maximum sustainable yield in such fishery." Anticipated benefits of the program as discussed in Amendment 26 include: increased market stability, elimination of fishing season closures, increased flexibility for fishing operations, cost-effective and enforceable management of the red snapper commercial sector, improved safety at sea, and

balance of social, economic, and biological benefits from the red snapper commercial sector. Additionally, the program is intended to provide direct and indirect biological benefits to the red snapper population and other marine resources by eliminating quota overages and reducing bycatch and discard mortality. The social, economic, and biological benefits collectively are intended to assist NMFS and the Gulf Council in preventing overfishing and rebuilding the Gulf red snapper population through the stewardship aspects of the RS-IFQ program.

1.4 Need for RS-IFQ Program Review

The Magnuson-Stevens Act specifies limited access privilege (LAP) programs are not permanent and may be revoked, limited, or modified at any time. If a program is meeting its stated objective then it will likely be continued, but the Gulf Council reserves the right to revoke the privilege for cause. The review provision specified by the Magnuson-Stevens Act requires the Gulf Council to evaluate the effectiveness of the system and discuss whether it should be modified, extended, or terminated. Congress in the 2004 session included proposed Magnuson-Stevens Act language requiring such review, e.g., S. 2066 and H.R. 4749.

The Gulf Council decided the effectiveness of the proposed RS-IFQ program should be assessed at regular periodic intervals that ideally coincided with stock assessment updates. This need for evaluation was also shared by the Gulf Council's AHRS-AP. Both the Gulf Council and AHRS-AP concluded five years was sufficient time for the program to evolve before being evaluated. Little change was expected to occur in the first few years of the program.

While the duration of RS-IFQ privileges has no direct effects to the physical, biological, and ecological environments, it does have positive indirect effects through the effectiveness of the program in achieving its intended objectives with respect to derby fishing and overcapitalization. A permanent or long-term privilege would encourage long-term planning and investment. Long-term privileges also reduce uncertainty caused by regulatory changes and provide incentives to invest in the fishery. Removing the race to fish reduces the incentive to purchase larger vessels and more equipment, and fish in unsafe conditions. IFQs provide a greater incentive for fishermen to utilize fishing and handling methods that increase fish survival and reduce bycatch of non-targeted species.

2.0 Summary of Legal Requirements for Program Review

Section 303A(c) of the Magnuson-Stevens Act specifies requirements for LAP programs submitted by a fishery management council or approved by the Secretary of Commerce. Any such LAP program shall:

- assist in rebuilding a stock if it is overfished,
- contribute to reducing over capacity if the fishery is over-capitalized,
- promote safety, fishery conservation, and management, and social and economic benefits,
- prohibit any person other than a U.S. citizen, corporation, partnership or other entity, or a permanent resident alien from acquiring a privilege to harvest fish,
- require that all fish harvested be processed on vessels of the U.S. or on U.S. soil,
- specify the goals of the program,
- include provisions for regular monitoring and review by the Council and the Secretary of the operations of the program,
- include an effective system for enforcement, monitoring, and management, and
- include an appeals process for administrative review of decisions regarding initial allocation of limited access privileges.

With regard to review of the program, the Magnuson-Stevens Act specifically states:

> *"(G) include provisions for the regular monitoring and review by the Council and the Secretary of the operations of the program, including determining progress in meeting the goals of the program and this Act, and any necessary modification of the program to meet these goals, with a formal and detailed review 5 years after the implementation of the program and thereafter to coincide with scheduled Council review of the relevant fishery management plan (but not less frequently than once every 7 years);"*

Neither Amendment 26 nor the Magnuson-Stevens Act specified what information should be included in the review. The Magnuson-Stevens Act requires, at minimum, a summary of progress made toward meeting the program's goals and those set out by the Magnuson-Stevens Act, as well as any suggested modifications to the program to better meet the intended goals.

The goals and objectives of the RS-IFQ program are summarized in the Introduction and are not repeated here. The goals of the Magnuson-Stevens Act, as they relate to LAP programs, are more numerous and include, but are not limited to:

- preventing overfishing,
- basing conservation and management measures on the best available science,
- establishing conservation and management measures that consider efficiency in utilization of resources, except that no such measure shall have economic allocation as its sole purpose,
- establishing conservation and management measures that, where practicable, minimize costs and avoid unnecessary duplication,

- establishing conservation and management measures that take into account variations among, and contingencies in fisheries, fishery resources, and catches,
- accounting for the importance of fishery resources to fishing communities by utilizing economic and social data to maintain sustained participation of such communities and to the extent practicable, minimize adverse economic impacts on such communities,
- minimizing bycatch and bycatch mortality to the extent practicable,
- promoting safety at sea,
- ensuring initial allocations are fairly and equitably distributed, and
- ensuring that limited access privilege holders do not acquire an excessive share of the limited access privilege program.

NMFS released a national catch share policy in November 2010 (NOAA 2010) which encourages that catch share programs are designed to help maintain or rebuild fisheries, and sustain fishermen, communities, and vibrant working waterfronts. The policy recommends Councils periodically review all catch share and non-catch share programs to ensure that management goals are specified, measurable, tracked, and used to gauge whether a program is meeting its goals and objectives. The policy also specifies that the resource allocation between sectors should be reviewed on a regular basis.

3.0 Program Performance and Review

The following section provides a review of RS-IFQ program performance during the first five years of the program. Program performance is based on data collected from a variety sources (see Introduction). Wherever possible, program performance is evaluated based on whether the program's and/or Magnuson-Stevens Act's goals and objectives are being met. Other topics are also discussed as they pertain to ways to modify the existing program to better meet specified goals.

3.1 Overview of Studies Available for Program Review

3.1.1 NMFS Red Snapper IFQ Annual Report

Annually, NMFS produces a report summarizing RS-IFQ program statistics and performance. The 2011 RS-IFQ Annual Report (SERO 2012b) represented the completion of the fifth RS-IFQ season and built on information summarized in past annual reports. The report focuses on changes in participation in the program (i.e., shareholders, allocation holders, vessels, dealers), the distribution of shares and allocation over time, changes in RS-IFQ values (i.e., share prices, allocation prices, and ex-vessel prices), changes in effort (i.e., number of vessels, trips, and days away), differences in bycatch and discard mortality, and law enforcement activities. The majority of information in this report is compiled directly from the Gulf IFQ online data collection system, with supporting information generated from the SEFSC reef fish observer program, SEFSC coastal logbook program, and NOAA Office of Law Enforcement (OLE) data sources.

3.1.2 RS-IFQ Shareholder Attitudes and Perceptions Study

Louisiana State University's Center for Natural Resources and Policy conducted a mail survey to:

- collect demographic information on the participants of the program,
- elicit attitudes and perceptions about the performance of the RS-IFQ program, paying special attention to crewmember experiences, changes in fishing practices, and relationships with dealers,
- analyze perceptions regarding the potential RS-IFQ outcomes, investment and disinvestment decisions, future plans in the red snapper component of the reef fish fishery, share and allocation transfers, and prices, and
- compare the attitudes and perceptions relative to the RS-IFQ program with those reported in other IFQ program studies.

The survey was mailed to the 428 RS-IFQ accounts on record as holding shares as of January 1, 2011. By the end of the study in September 2011, 179 responses had been received, representing 43% of the accounts holding shares and accounting for approximately 50% of the shares (Boen and Keithly 2012). The survey was not sent to RS-IFQ account that only held allocation.

The report documents a number of interesting findings. The study found that participants with large shareholdings tended to be very satisfied with the RS-IFQ program, whereas those with small shareholdings were the least satisfied with the program. The study indicated that the industry believed that the IFQ program had reduced derby-fishing conditions. Additionally, medium and large shareholders, as well as western Gulf shareholders, agreed that the RS-IFQ program had decreased crowding on fishing grounds. The study reports that 65% of respondents stated that they did not make any major capital investments or dis-investments (i.e., purchasing or selling vessel and harvesting equipment) since the onset of the program. Approximately 21% reported making major investments, whereas only 13% reported making major dis-investments. When the survey asked about their future participation plans over the next five years, 46% of the fishermen indicated that they planned to keep activities at the same level for the next five years, 27% reported that they planned to leave the fishery or reduce activities by keeping the shares but selling annual allocation to others. Approximately 20% of the respondents stated that they intended to increase financial commitment by buying more allocation or shares. The industry also indicated that the RS-IFQ program had the potential to increase consolidation as well as make it more difficult for people to enter the fishery. Additional survey results are interspersed throughout this document.

3.1.3 Stochastic Frontier Analyses

Stochastic distance frontier methods were employed to investigate whether the RS-IFQ improved technical efficiency and reduced overcapacity. Solis et al. (2012) found that the commercial fleet experienced small increases in technical efficiency following the introduction of the RS-IFQ program. Under IFQs programs, the technical efficiency of the fleet is expected to improve because fishermen can freely choose the number and duration of their fishing trips and select the optimal combination of capital and labor to maximize the value of their harvest. Past regulations, such as trip limits and short fishing seasons, tended to erode fishermen's ability to harvest in a cost effective manner. Solis et al. (2012) estimated that the technical efficiency of the vertical line and longline fleets increased by 5% and 14%, respectively. Their study also showed that the efficiency gains were mainly driven by the marginal (i.e., less technically efficient) vessels exiting the fishery rather than by significant efficiency gains by the remaining vessels. In a second study, Solis et al. (2013) finds that substantial overcapacity remains in the fishery after the first 5 years of the program. They estimated that approximately 61 vessels (approximately 1/5 of the fleet) could harvest the entire 2011 red snapper commercial quota.

3.1.4 Southeast Fisheries Science Center Economic Analyses

The SEFSC conducted several analyses to explore the economic performance of the RS-IFQ program. These studies reviewed the empirical evidence to examine whether the anticipated impacts of the program met the objectives of the program and matched with the experience of other catch share programs. These analyses drew from several sources including the SEFSC coastal logbook and RS-IFQ database. The analyses examined changes in fleet size, fleet composition, and changes in fishing practices (e.g., landings, revenue, and effort). The analyses also investigated the distribution of shares across participants (share concentration) and potential ability of a few participants to influence market prices (market power).

3.1.5 SEDAR Stock Assessments

Information from recent red snapper stock assessments was used to assess biological outcomes in this review. The most recent completed stock assessment was in 2009 (SEDAR 7 Update 2009) and provided trends in fishing mortality during the first two years of the RS-IFQ program. A new benchmark stock assessment, SEDAR 31, is currently ongoing and will be completed in 2013. Trends with relation to discards were provided through preliminary results from SEDAR 31. An assessment workshop for this assessment was held in January 2013 and results from that workshop were incorporated in this review, where applicable.

3.2 Socioeconomic Outcomes

3.2.1 Reduce Overcapitalization

IFQs have been heralded as a promising tool to reduce overcapacity and improve technical efficiency (Solis et al. 2012 and 2013). An important driver behind the RS-IFQ program was the need to generate incentives to balance the harvesting capacity of fleets with the productivity of fish stocks and market conditions. The expectation is that the RS-IFQ program would reduce any excess capital and labor employed in the fishery. The presence of excessive harvesting capacity is economically undesirable because it signals the presence of unwarranted investments, which can have adverse consequences on the sustainability of the stocks and efficiency and profitability of the fleet. In the following sections, we present measures of participant, fleet, and effort consolidation.

3.2.1.1 Participation Consolidation

Insight into the economic performance of the program can be gained by examining changes in shareholdings over time. Under an IFQ program, fishermen are anticipated to adjust the scale and scope of their operations to improve their profitability. Because the more efficient (profitable) fishermen will be willing to pay more for holding additional shares (and/or allocation), shares (and/or allocation) are expected to gravitate towards these more efficient producers. Excess harvesting capacity is decreased as the less efficient producers sell their harvesting privileges and exit the fishery.

Prior to the RS-IFQ program, the red snapper class licenses (1 and 2) limited the amount of red snapper harvested per trip (see Introduction). Of the 554 initial RS-IFQ accounts 82% belonged to permit holders who only had Class 2 licenses (200 lb trip limits), whereas the remaining 18% belonged to those who had only Class 1 (2,000 lb trip limit) or jointly Class 1 and 2 licenses (Table 3). All of the initial accounts with small shareholdings (< 0.05%) were previously Class 2 license holders, whereas all initial accounts with large shareholdings (≥ 1.5%) previously held Class 1 licenses (Table 3). More than half of the initial accounts with medium shareholdings (< 0.05 – 1.49999%) had Class 1 licenses, with the remaining holding Class 2 licenses.

By the end of the year (EOY) 2007, 60 of the previous Class 2 license holders and seven Class 1 license holders had sold all of their shares (Table 3). In that same time period, 23 previous Class 2 license holders and 17 previous Class 1 license holders had increased their shareholdings

(Table 3). By EOY 2011, the number of RS-IFQ accounts holding shares had decreased 25% since the start of the program (Figure 2). Most of the attrition took place in those accounts holding small amounts of shares (< 0.05%) (Figure 2). The greatest decrease in the number of accounts holding shares occurred in 2007. Despite a decrease in the number of accounts holding small share percentages, these accounts still comprise the vast majority of the RS-IFQ accounts. By EOY 2011 there were only 18 accounts holding ≥ 1.5% of shares.

The number of accounts with shares changes over time as shareholders acquire or sell some or all of their shares. Account holders may sell all of their shares for a variety of reasons: exiting the program, transferring to a new account due to a permit change[1], or managing related accounts[2] from one account. Across all years, the majority of accounts selling all their allocation had small shareholdings. The greatest number of accounts selling all of their shares occurred within the first year, and over 75% of these were from accounts holding a small percentage of shares (<0.05%) (Table 4). During the first three years of the RS-IFQ program, a small number of accounts (≤10) acquired shares for the first time (Table 5). Accounts acquiring shares for the first time may result from a variety of reasons: new entrants to the RS-IFQ program, existing participants that previously held only allocation, new accounts established due to a permit holder change[1], or transfers from a related account[2]. Most of the new accounts acquired small share percentages (<0.05%) (Table 5). The numbers of new shareholders increased considerably from 6-10 new accounts in 2007-2009 to 22-28 new accounts in 2010-2011 (Table 5). The 2010 and 2011 new shareholders mostly obtained medium percentages of shares and many had not previously held Class 1 or Class 2 licenses. This increase in new shareholders, and in particular those acquiring a medium percentage of shares, may be in part due to the implementation of the GT-IFQ program in 2010. Many fishermen participate in both the RS-IFQ and GT-IFQ programs and exchanges in shares or allocation between programs is common, although share transfers are individually recorded by share category.

In the RS-IFQ program, an account holder may obtain allocation through shares (distributed at the beginning of the year or from any mid-year increase) or from the purchase of allocation from another account holder. The total number of accounts that held allocation within a given year decreased in the first three years (2007 = 596, 2008 = 547, and 2009 = 530) (Figure 3). The number of accounts holding allocation increased in 2010 (n = 598) and can be attributed to the start of the GT-IFQ program, under which GT-IFQ accounts were eligible to buy red snapper allocation. In 2011, the number of accounts holding allocation decreased to 589. The number of accounts with allocation but without shares has been increasing every year (Figure 3). Initially, only 7% (n = 42) of the accounts held allocation without shares, but by 2011 this percentage increased to 25% (n = 150). This increase may in part be due to GT-IFQ accounts buying red snapper allocation, particularly for landing incidental catch of red snapper. Of the vessels landings GT-IFQ species, 82% also landed red snapper (SERO 2012a).

[1] Accounts were established based on name(s) of the Gulf reef fish permit holder. If the name(s) of the permit holder changes (e.g., adding/removing a spouse from a permit), a new account was established to link to the permit. In 2012, a permit was no longer required to establish a RS-IFQ account, although it is still required to harvest red snapper.

[2] Because accounts are based on permit holders, an individual or business may be part owner in multiple permits, which may be considered a related account. (e.g., John Doe has an account and John and Jane Doe have an account).

In the RS-IFQ program, after an account acquires shares, that account retains those shares, regardless of Gulf reef fish permit status, until they are sold to another RS-IFQ participant. After the first year of the program there was an increase in the number of accounts which held shares (and the associated percentage of shares), but did not have a valid Gulf reef fish permit (Figures 4 and 5). In 2007, non-permitted accounts accounted for 15% of all accounts with shares, but by 2011 non-permitted accounts had increased to 29% (Figure 4). Non-permitted accounts held between 13-16% of the shares for the first four years, but that increased to 18% by EOY 2011 (Figure 5). It should be noted that some non-permitted accounts with shares are related to permitted accounts without shares[2]. In these instances, the non-permitted shareholding account will transfer allocation to the permitted, non-shareholding account to harvest red snapper. At this time, no methodology has been created to distinguish which accounts may be related to other accounts.

The number of dealers purchasing red snapper has increased within the last two years of the program (Figure 6) with 82 dealers in 2011 that purchased red snapper. The increase in dealers in 2010 and 2011 was most likely influenced by the start of the GT-IFQ program as well as an increase in RS-IFQ shareholders obtaining a Gulf dealer permit. Until 2010, the majority of dealers purchased fish from 3-10 different fishermen (shareholder accounts), followed by dealers working with 1-2 fishermen, and then those dealing with 11 or more different fishermen (Figure 6). In 2010, there was a shift toward more dealers receiving fish from only 1-2 fishermen. By 2011, more than half of the dealers were working with only 1-2 fishermen (Figure 6). The shift towards more dealers working with a smaller number of fishermen is most likely influenced by an increase in fishermen becoming their own dealers (pers. comm. with industry representatives). Unfortunately, linking a shareholder account to a dealer account is not currently possible in the system, especially as accounts may be held by different individuals and/or corporations.

Since the start of the program, the majority of RS-IFQ shareholdings were held by fishermen located in Florida and Texas (Figure 7). As of 2011, 49% of the shares were held by Florida residents, 30% by Texas residents, 18% by other Gulf states, and 2% by non-Gulf states (Figure 7). The change in shareholdings among states can be related to share transfers among accounts in different states or changes in addresses for existing accounts.

An often-voiced concern about the implementation of IFQs is the potential for concentration of quota ownership and market power. Naturally, as less efficient operators sell their shares, the remaining operators will control a larger share of the quota, which potentially could lead to pricing power by these firms. To investigate this, the Gini coefficient, a measure of inequality, and the Herfindahl-Hirschman Index (HHI), an indicator of the amount of competition in the marketplace, were applied to both shareholdings at the lowest known entity (LKE)[3] and landings. A Gini coefficient equal to zero indicates perfect equality (i.e. all participants hold the same number of shares) whereas a score of one indicates perfect inequality. The Gini coefficients show that the distribution among the LKE is highly unequal (Table 6). The LKEs with the largest shares (≥1.5%) increased their stake of the quota from approximately 37% in

[3] The lowest known entity level is an individual person unless a business's shareholders are unknown, where the business is then the lowest known entity. Business's shareholders identities were not collected on Gulf reef fish permit applications until 2009. In 2012, an IFQ account could not be activated unless business shareholder information was supplied to the IFQ system.

2007 to 46% in 2011 (Table 6), even though their numbers remained similar (15-18 LKEs). In contrast, the LKEs with medium shares (0.05-1.49999%) experienced the most of the attrition, with their shares of the quota dropping from 58% in 2007 to 51% in 2011. The LKEs with the smallest shares (<0.05%), which are the majority of the LKEs, decreased their shareholdings from 4.7% in 2007 to 3.2% in 2011. Gini coefficients for landings decreased slightly from ~0.8 pre-RS-IFQ to ~0.75 post-RS-IFQ, indicating a slightly greater distribution of red snapper landings among vessels post-RS-IFQ (Table 7).

HHI scores approach zero when a market is composed of a large number of firms of similar size and reaches a maximum of 10,000 when a market is controlled by a single firm. The HHI scores for the LKEs suggest that the market for shares is competitive (Table 6). The HHI index for landing shows a steady but small increase in concentration since the RS-IFQ program was implemented (Table 7). This may coincide with a steady decrease in the number of reef fish permits over the same time period. Gulf reef fish permits declined ~20% from 2005 to 2011, whereas the number of vessels harvesting red snapper declined 25% during that same period of time. The HHI scores were all below 190 (Tables 6 and 7). Federal merger guidelines indicate that HHI scores of less than 1,500 indicate a lack of market concentration and an unlikely presence of adverse competitive effects (U.S. Department of Justice and Federal Trade Commission, 2010).

3.2.1.2 Fleet and Effort Consolidation

This review indicates some consolidation in the commercial fleet. SEFSC coastal logbook trip reports[4] indicate that the number of active vessels decreased from 440 vessels in 2006 to a low of 296 in 2009 and then increased to 368 in 2011 resulting in a net decline of 16% (Table 8). Likewise, the number of fishing trips decreased by 28% from 4,714 in 2006 to 3,389 in 2011 (Table 8). Attrition levels are more pronounced when viewed as five years pre- and post- RS-IFQ averages (2002-2006 vs. 2007-2011) which show that the fleet size contracted by 28% and the number of fishing trips decreased by 42%. Nonetheless, care must be exercised when attributing these declines exclusively to the RS-IFQ program because there were significant quota decreases at the onset of the program. Average quota levels during the first five years of the RS-IFQ program were approximately 2/3 of the average levels observed during the five years preceding the RS-IFQ program. Also, noteworthy is the increase in the number of fishing vessels and fishing trips that, starting in 2010, were partly driven by red snapper quota increases and an influx of participants from the GT-IFQ program (Figure 9).

While the number of vessels harvesting red snapper has decreased over time, the distribution of the landings among the vessels has remained similar both pre- and post-RS-IFQ (Figure 8). In both time periods, the top 25% of red snapper landings were landed by only 2% of the vessels, whereas the bottom 25% of landings were landed by 87-84% of the vessels. Of the vessels landing the bottom 25%, on average 46% of those vessels landed less than 500 lb pre-RS-IFQ, and only 36% post-RS-IFQ.

[4] Logbook trip reports and RS-IFQ database statistics closely match since the majority of the red snapper landings occur in federal waters. The tables offered refer to vessels that operated during the *open* season only. To facilitate pre- and post- RS-IFQ comparisons we only use logbook figures; however, we provide the official RS-IFQ figures for the interested reader.

Most of the fleet consolidation took place in the vertical line fleet, which decreased by 16% from 374 vessels in 2006 to 314 in 2011 (Table 9).[5] The number of vertical line trips decreased by 30% for the same period (Table 9). Most of the displaced vertical line vessels began targeting other mid-water snappers, especially vermilion snapper and shallow-water groupers such as red grouper. The number of longline vessels decreased by 25% (from 56 to 42) and the number of longline trips decreased by 20% during the same 5-year interval (Table 9). Most of the displaced longline vessels began catching more shallow-water groupers (specifically red grouper), deep-water groupers, and tilefish.

Following the fleet consolidation pattern, there was an early decline in the total amount of time spent at sea and labor employed, which began reversing in 2010. Table 8 shows that the total number of days fished declined from 13,537 in 2006 to 9,444 in 2009 and then increased to 14,613 in 2011 resulting in a net increase of 8%. Over the five-year average pre- and post-RS-IFQ interval, fishermen took slightly fewer trips with smaller crew sizes, but the trips became longer. The number of days fished and crew size decreased by 3% and 7%, respectively but the average length of the trips increased from 2.6 to 4.3 days (approximately 66%). Average crew sizes decreased marginally from 3.0 to 2.8 between these five year intervals.

The vertical line fleet had reductions in days at sea and crew days, whereas these increased in the longline fleet. Between 2006 and 2011, vertical line vessels decreased the amount of time spent at sea by 1% and the number of crew days by 9%. Conversely, longline vessels increased the amount of days at sea and crew days by 37% and 31% respectively due to the influx of vessels participating in the GT-IFQ program off the west coast of Florida. Relative to five-year pre- and post-RS-IFQ averages, the vertical line vessels decreased their amount of time at sea by 7% and crew days by 10%, whereas longline vessels increased their amount of time at sea by 1% and crew days by 2%.

In addition to adjusting the pace of fishing activities, fishermen also changed their targeting behavior. Prior to the RS-IFQ program, red snapper was the dominant species among vessels using vertical line gears (Figure 10). After the RS-IFQ program, the catch composition became more diverse, with the vertical line fleet catching more vermilion snapper and shallow-water groupers, especially red grouper. Although red snapper landings remained about constant, their percentage contribution to overall landings decreased by half. Similar changes in catch composition were also apparent in vessels using longline gear (Figure 10). Red grouper landings became more prevalent after the start of the GT-IFQ program.

To further understand the observed changes in targeting behavior, we estimated the contribution of red snapper to overall landings across fishing trips. Prior to the RS-IFQ program, the percentage of trips using vertical line gear where red snapper compromised between 0-25% of the catch was less than 20%, but after the RS-IFQ program began that percentage increased to 35-43% (Table 10). Conversely, prior to the RS-IFQ program, more than half of the vertical line trips had red snapper comprising 75-100% of the total catch, while post-RS-IFQ implementation

[5] These gear specific statistics should be treated with caution since many vessels use multiple gears throughout the year. In this paper, we assigned a red snapper vessel to a specific gear type by the plurality of trips that utilized that gear during a given year. Thus, fleet attrition numbers are slightly different from those reported in Table 8. These tables refer to vessel that operated during the *open* season only.

this declined to nearly one quarter of the trips (Table 10). For trips using longline gear, prior to the RS-IFQ program red snapper consisted of 0-25% of the catch for more than half of all trips. After the RS-IFQ program, red snapper consisted of 68-90% of the trips, and increased again to nearly 98% after the start of the GT-IFQ program (Table 10). The above ratios underscore that trips alone are not good indicators of changes in capacity or overcapacity due to changes in targeting behavior. Hence, formal analyses of capacity and overcapacity are required. FAO (1998) defines capacity as the maximum amount of landings over a period of time that can be produced by a fishing fleet if fully utilized given the exiting biomass and available technology. Overcapacity is the difference between capacity and a desired output level (i.e. quota).

Formal analyses that relied on stochastic distance frontier methods were employed to investigate whether the RS-IFQ program reduced overcapacity and enhanced the (technical) efficiency of the fleet (Solis et al. 2012 and 2013). Preliminary work by Solis et al. (2013) indicates that the harvesting capacity of the fleet decreased after the adoption of the RS-IFQ program. The decline was mainly driven by vessels exiting the fishery. However, the overcapacity remains high. Solis et al. (2013) estimated that 61 vessels operating vertical lines (approximately 1/5 of the current fleet) could harvest the entire 2011 commercial quota. Solis et al. (2012) found that technical efficiency of the remaining vertical line fleet increased by 5% following the RS-IFQ program. These efficiency gains were driven primarily by the less efficient vessels exiting the fishery rather than by marked efficiency gains by those vessels that remained in the fishery.

3.2.2 Achievement (or Harvesting) of Optimum Yield

National Standard 1 of the Magnuson-Stevens Act mandates conservation and management measures prevent overfishing and achieve optimum yield (OY) from a fishery. OY is defined as the amount of fish that will provide the greatest overall benefit to the nation, particularly with respect to food production and recreational opportunities. OY must take into account the protection of marine ecosystems and is prescribed based on the maximum sustainable yield (MSY) from the fishery, as reduced by any relevant economic, social, or ecological factors. If a stock is overfished, OY must be specified at a level consistent with producing the MSY in a fishery. Currently, the acceptable biological catch (ABC) for red snapper is set at 75% of the fishing mortality rate (F) that produces MSY. This results in a large buffer between the overfishing limit (yield at Fmsy) and the ABC. The ABC is further divided between the commercial and recreational sectors based on a 51:49 allocation. The sum total of the commercial and recreational quotas equals the ABC. In practice, the commercial sector's share of the ABC, i.e., the commercial quota is equivalent to the sector's share of OY for the red snapper fishery. Commercial quotas that are equal or very close to the quota without exceeding it would be consistent with the prevention of overfishing and achievement of OY mandated by the Magnuson-Stevens Act. The performance of the RS-IFQ program in achieving OY can be assessed by measuring its ability to constrain harvest at or below the quota while allowing RS-IFQ participants to harvest as much red snapper as possible.

Between 2000 and the start of the RS-IFQ program in 2007, the red snapper commercial season length was limited to between 61-131 fishing days (Table 1). Since the start of the RS-IFQ program, the season length has been year round (365 days) with fishing occurring nearly every

day (Figure 11). During each year, more than 95% of the quota has been landed annually (Figure 12). In 2011, the quota was raised to 3,300,901 lb gutted weight and 98.1% of the quota was landed. Because allocation is annual there is often un-harvested allocation remaining in accounts at the end of the year. Every year, the remaining allocation was low (< 5% of the quota) and, excluding 2010, the number of accounts and the percentage of remaining allocation have decreased each year (Figure 13). The higher number of accounts with remaining balances in 2010 may have been affected by one or more of the following: GT-IFQ program implementation, mid-year quota increase, and/or the Deepwater Horizon MC252 (DWH) oil spill event. The lowest remaining total allocation balance occurred in 2011 with just 2% of the quota remaining, distributed among 236 different accounts (Tables 11 and 12).

The largest average monthly landings occurred in the spring and December (Figure 14). Increased landings in the spring can be attributed to increased fishing effort to supply fish for the Lenten season, whereas the December increase occurs as commercial fishermen seek to harvest unused allocation before the end of the fishing season (December 31). The effect of the DWH oil spill can be seen in the summer and fall landings in 2010 (Figure 14), where despite an increase in quota the landings decreased as fishing areas were closed and public perception affected the market.

Account activity can be determined through allocation transactions. An account was considered active if the account landed, sold, and/or bought allocation in that year. During the first year of the program, 29% of accounts (173 accounts) were inactive (Table 12) and contained 2.6% (equivalent to 78,543 lb) of the final quota (Table 11). By 2011, the number of inactive accounts decreased to 102 accounts (17% of all accounts) and contained only 1.5% (50,743 lb) of the year-end quota (Tables 11 and 12; Figure 13). Except for 2010, the remaining allocation at the end of year primary resided in inactive accounts (Figure 13). More than half of the inactive accounts are initial accounts that were never accessed by the user. All accounts were contacted by mail and/or phone by January of 2012 to verify citizenship, and therefore, we expect to see a further decrease in inactive accounts in 2012.

Active participants can be divided into two broad categories: Those who landed fish and those who only traded allocation. There has been a slight increase in the percentage of accounts that are only trading allocation (no landings) (Table 12). In 2007, 144 accounts (24% of all accounts) only traded allocation, compared to 159 accounts (27% of all accounts) in 2011 (Table 12). Accounts without shares comprise a small portion of these accounts (4-13%), although that has grown in recent years (2010-2011) (Table 12). Another component of these accounts were those that hold shares but no longer had a valid Gulf reef fish permit. These accounts were not eligible to harvest red snapper or buy allocation, but could sell allocation. Accounts that held shares and had a valid Gulf reef fish permit comprise between 54-58% of the account only trading allocation. Accounts that hold shares, with or without a Gulf reef fish permit, may have a related account to which they transfer their allocation to harvest fish. For example, a fisherman that incorporates each vessel (i.e. each vessel is owned by a different business, but all businesses are owned by the same fishermen) may have transferred all shares to one account and then distribute allocation to each vessel as needed to harvest red snapper. In 2010 and 2011, approximately 48% of the pounds traded were from accounts only trading allocation (Table 11) versus the 33-41% seen in previous years. Approximately 50% of the accounts containing allocation (obtained

through shares or purchase of allocation) landed fish each year (Table 11). In 2010 and 2011, this increased to 56% (Table 11). Although the number of accounts that have landed fish has increased over time (297 in 2007 vs. 328 in 2011), the number of accounts that have landed fish *and* held shares has decreased (Table 12). As of 2011, only 60% of the accounts landing fish also hold shares. A small number of accounts have only landed allocation and neither bought nor sold any allocation (Table 11). In 2007, there were 99 accounts (17%) that only landed fish, but the number has been steadily decreasing to 30 accounts (5%) in 2011 (Table 12).

Initial assessment of trends in landings and RS-IFQ account activity indicate landed yield is close to OY, a limited amount of red snapper quota is not harvested each year. Remaining quota is largely associated with inactive accounts, which have declined over time. Despite an increased percentage of shareholders not holding reef fish permits, there has been little change in unharvested allocation. It is uncertain how future changes in RS-IFQ participation and permit status will affect markets for allocation (See Social Impacts for a more detailed discussion). If fishermen are less willing to buy allocation because it is cost prohibitive, then OY may not be achieved . Additionally, increases in discards could lower landed yields, as bycatch mortality would result in foregone yield. The Gulf Council may want to consider redistributing or reallocating allocation held in inactive accounts.

3.2.3 Mitigating the Race to Fish

Another goal of the RS-IFQ program was to mitigate the race to catch the most fish before other fishermen. Derby-like fishing practices led to progressively shorter fishing seasons, trip limits, market gluts, depressed prices, increased harvesting costs, and unsafe fishing conditions (Waters 2001). Among the most noticeable changes after the program's inception was the lengthening of the fishing season. The fishing season increased from an average of 109 calendar days during the five years preceding the RS-IFQ program to a year-round effort, which gave fishermen greater flexibility to meet market demands.

In addition to adjusting the timing of fishing activities, fishermen also changed the pace and scope of their operations. Following the introduction of RS-IFQ, fishermen began taking fewer but longer trips.[6] These changes were driven by the removal of trip limits and 10-day fishing windows. All of these factors encouraged a more efficient scale of operation. Red snapper fishermen not only increased their landings but also adjusted their catch mix (Figure 10, Table 10).

Average red snapper landings per trip have decreased over time, but average landings are influenced by many factors such as targeted species (i.e., red snapper targeted vs. non-targeted), trip length, and the number of trips. The total average landings for all species per trip for vessels that captured at least one pound of red snapper have increased by nearly 1,000 lb per trip since the start of the program (Table 8). This is most likely influenced by the catch composition pre- and post-RS-IFQ. Prior to the start of the RS-IFQ program, red snapper dominated the catch composition for vessels in the vertical line fleet (Figure 10), but afterwards red snapper only

[6] The number of days fished in the directed fleet increased from 2.8 to 4.6 days between 2006 and 2009 whereas in the by-catch fleet they climbed from 3 to 3.6 days for the same period.

comprised approximately half of the harvest. Similar changes in catch composition were also apparent in vessels using longline gear to harvest red snapper (Figure 10). The catch composition changes again after the start of the GT-IFQ program (see Reduce Overcapitalization for more details). Figure 15 shows that following the adoption of the RS-IFQ program the vertical line fleet's red snapper revenue composition changed significantly. As red snapper quota became constrained, its contribution to total revenue decreased as fishermen began catching more vermillion snapper. Similarly, longline vessels began catching more red grouper and deep-water groupers, especially after 2010 when the GT-IFQ program began.

Another anticipated outcome of the program was an increase in dockside prices because fishermen no longer had to race to fish, which would reduce market gluts and provide a fresher product. Dockside prices have been under-reported by dealers to minimize cost recovery fees and/or capital gains, as well as due to contractual arrangements in which dealers with shareholder accounts lend the allocation to fishermen and then only report the dockside prices net of the allocation price. The number of under-reported transactions has increased since the start of the program, with between 8-29% of the transactions excluded each year (Table 13). RS-IFQ data shows that average inflation-adjusted reported dockside prices, after discarding misreported prices[7], increased by 6% from $3.99/lb in 2007 to $4.26/lb in 2011 (Table 13; Figure 16). The largest increase in inflation-adjusted dockside prices occurred in the second year of the program with an increase of $0.25/lb, and thereafter remained near the $4.26/lb price (Table 13; Figure 16).

The RS-IFQ program was also expected to create greater market stability. Figure 17 shows considerable in-season price variability, although this variability in prices is partly driven by post-RS-IFQ price reporting practices. Dockside prices tend to increase during the Lenten season (Figure 17). Monthly deviations in ex-vessel prices from pre- and post-RS-IFQ can be used as a metric for investigating future price volatility.

3.2.4 Quota and Allocation markets

Additional insight into the economic performance of the program can be gained by examining the behavior of the share and allocation markets. As fishermen no longer have to outcompete other fishermen for a share of the catch, the profits will likely increase because fishermen can better time and adjust the scale of their operations to take advantage of market conditions. In addition, the value of shares and allocations is expected to increase because the most efficient fishermen would be willing to pay higher prices to purchase additional privileges (shares or allocation) from the less efficient operators. Theoretically, allocation prices should reflect the expected annual net profit from harvesting one unit of quota whereas share prices should reflect the present value of the flow of expected net returns from harvesting one unit of quota.

Share transfers peaked at the start of the program (n = 108) and have since stabilized at 75 to 79 transactions per year. The total percentage of shares transferred was highest during the first year (11%), but has since fluctuated between 4 to 8% (Figure 18). The 8% transferred in 2010 was probably indicative of the start of the GT-IFQ program, as many fishermen participate in both programs. There is a broad range of share percentages transferred in all years, with 2011 average

[7] Ex-vessel prices ≤ $2.60 and ≥ $10.00/lb were excluded from all price analyses.

share transfer percentages (0.07%) the lowest since the start of the program. Despite low average share transfer percentages, median percentages increased slightly to 0.03% in 2011. Nearly half or more of the share transactions each year are either missing price information or had under-reported price information (Table 14). Excluding missing or misreported prices[8], the average price per share when adjusted for inflation more than doubled from 2007 when it was $11.78 per equivalent pound to 2011 where it was $28.87 per equivalent pound (Table 14). The larger increases occurred in 2009 (+$9.29/equivalent pound) and 2011 (+$8.87/equivalent pound) (Table 14).

Individual units of allocation cannot be tracked in the system and only allocation transfers between accounts are analyzed. The total number of transactions and total amount of allocation traded has increased since the start of the program (Figure 19). In 2010, the amount of allocation transferred was double previous years due to a combination of the following factors including, increased quota, the start of the GT-IFQ program, and a structural change in the database. The previous database system allowed for an under-representation of allocation transfers because a single vessel could land under multiple shareholder accounts, thereby bypassing an allocation transfer. This is no longer possible in the current system. In 2011, the amount of pounds traded increased to 3,639,394 lb with 2,155 transactions. The total allocation transferred for any given year can be greater than the quota as the same allocation may be traded multiple times. The median amount transferred between accounts has remained stable for the past three years at 500 lb. Upon consulting with industry representatives, around 500 lb is often transferred to a vessel at the start of a trip to allow for any red snapper caught while targeting another species.

The RS-IFQ quota market, particularly the allocation market, has been very active in terms of the number of transactions and the volume traded. The number of allocation transfers between entities increased from 808 in 2007 to 2,155 in 2011(Table 15) and the volume traded, as a percentage of the total catch, increased from 56% to 110% for the same period. Nearly or greater than a third of the allocation transactions for each year had misreported or missing allocation prices. Excluding missing or misreported allocation prices[9], the average price per pound of allocation, adjusted for inflation, increased by 27% from $2.16/lb in 2007 to $2.96/lb in 2011 (Table 15). Swiftly appreciating share and allocation values suggest that fishermen have been successful at maximizing profits from their quota.

The allocation price to share price ratio is a useful and commonly used indicator of economic performance. This ratio decreased from 18% in 2007 to 10% in 2011 (Table 16) suggesting that fishermen are feeling more secure about the RS-IFQ program. This ratio provides information about the implicit discount rate of the quota market. In general, decreasing discount rates indicate that fishermen have longer planning and investment horizons because the perceived uncertainty about future returns lessens. Therefore, if the ITQ program performs well, the implicit discount rate should be close to market interest rates (Asche 2001). Moderating implicit discount rates are common in well-performing IFQ markets around the world (Asche 2001).

[8] Share transfers with prices per equivalent pound that were ≤ $9/lb and ≥ $36/lb were excluded from all price analyses.

[9] Allocation transfers with prices per equivalent pound that were ≤ $1.20/lb and ≥ $5/lb were excluded from all price analyses.

3.3 Biological Outcomes

During initial development of the first RS-IFQ program in the mid-1990s, numerous biological problems that plagued the commercial red snapper sector were identified. Problems included: Increased red snapper discard mortality, quota overruns associated with derby fishing, regulatory discards and discard mortality during extended closed periods, and the creation of additional bycatch owing to increasing size limits (see Hood et al. 2007). Prior to the implementation of the RS-IFQ program in 2007, these problems continued to persist. The minimum size limit was 15 inches total length (TL), resulting in high rates of discards and discard mortality rates (GMFMC 2006). Fishing mortality of young, undersized fish (2-4 yrs. old) resulted in foregone future biomass and harvest (GMFMC 2006). Quota overruns were frequent, and derby-fishing conditions resulted in high discard mortality rates and poor handling practices. Overfishing of red snapper continued to occur and the stock had been overfished for several decades (SEDAR 7 2005).

The RS-IFQ program was intended to provide both direct and indirect biological benefits to red snapper and other marine resources by eliminating quota overages and reducing bycatch and discard mortality (GMFMC 2006). Biological benefits were expected to occur from improvements in fishing methods and processing practices, and slowing the pace of fishing whereby fishermen can choose when and where to fish. The RS-IFQ program was also expected to help address overfishing by decreasing fishing mortality associated with discards and bycatch because fishermen would have an incentive to minimize their costs (GMFMC 2006).

The following describes biological outcomes of the RS-IFQ program and commercial red snapper management in general. Biological outcomes are discussed in the context of changes in fishing mortality, quota overages, discards, and discard mortality.

3.3.1 Fishing Mortality

A benchmark stock assessment is currently underway and will be completed in 2013. Fishing mortality data summarized herein are based on the 2009 red snapper stock assessment update (SEDAR 7 Update 2009) which covers the first two years of the RS-IFQ program (2007-2008). Projections since the 2009 update have been presented to the Council's Scientific and Statistical Committee, but those projections do not partition fishing mortality by sector (B. Linton, SEFSC, pers. comm.) to determine how commercial fishing mortality rates have changed since 2008.

Numerous regulatory measures were implemented by the Gulf Council and NMFS in 2007 and 2008 to end overfishing of red snapper and rebuild the stock (see GMFMC 2006). These regulatory measures included the commercial RS-IFQ program, shrimp bycatch reduction, reduced quotas, a lower commercial minimum size limit, and a lower recreational bag limit. In combination, these management measures were intended to address and end overfishing and rebuild the stock. Changes in harvesting practices, lower quotas, and a lower minimum size limit, in addition to the RS-IFQ program, could all contribute to lower fishing mortalities. Therefore, the effects of the RS-IFQ program on fishing mortality cannot be directly determined.

Trends in commercial fishing mortality rates indicate fishing mortality declined from 2006 through 2008 (Figure 20). Fishing mortality rates for vessels using vertical line gear declined by 82% in the western Gulf and 23% in the eastern Gulf. Fishing mortality rates associated with longline vessels remained low in both the eastern and western Gulf, and comparable to 2006 levels. The SEDAR 31 stock assessment will provide more up to date information on fishing mortality rates through 2011 and the Gulf Council will have access to this information as it becomes available.

3.3.2 Quota Overruns

The red snapper commercial sector has been managed by quotas since 1990. Annual quotas were exceeded in 11 of 17 years between 1990 and 2006 (Table 2). During the five years prior to the RS-IFQ program (2002-2006), quotas were exceeded three times by 18,000-129,000 lb gutted weight annually. In comparison, quotas have never been exceeded since implementation of the RS-IFQ program. During the first five years of the RS-IFQ program, 95.8% to 98.1% of the quota was landed annually (SERO 2012b). The year in which the lowest percentage of the quota landed was 2010, the year of the DWH oil spill. The greatest percentage of the quota landed was in 2011. Approximately 60,000-134,000 lb gutted weight of red snapper quota was not harvested annually during the first five years of the RS-IFQ program.

3.3.3 Discards

Dead discards can significantly contribute to the overall mortality of red snapper and thereby reduce allowable yield. When the Gulf Council revised the red snapper rebuilding plan in 2007, total allowable catch was reduced by two million lb (from 7 to 5 million lb whole weight) in 2008-2009 to account for dead discards that could not be reduced by management measures (GMFMC 2006). Prior to implementation of the RS-IFQ program, discards and discard mortality were primarily due to the 15-inch TL minimum size limit and seasonal closures. On average, the commercial red snapper sector was open 109 days during the five years leading up to the RS-IFQ program (Table 2). The commercial season was closed 8-9 months each year and fish caught out of season had to be discarded. Red snapper still were discarded by Class 1 license holders (2000 lb trip limit) despite the larger trip limit due to the minimum size limit (15" TL) and fixed seasonal closures.

After implementation of the RS-IFQ program, fixed seasonal closures were eliminated. However, the amount fishermen harvest is now constrained by the RS-IFQ allocation they possess. Fishermen without large amounts of shares or allocation must discard red snapper when the allocation in their account is exhausted or purchase additional allocation from other shareholders to continue harvesting red snapper. Fish that could have been kept previously during open seasons prior to the RS-IFQ program must now be released. However, fish previously discarded during closed seasons may now be kept if a fisherman has sufficient allocation to harvest the fish. While anecdotal information from fishermen indicates there is some reluctance to purchase allocation because of the price of allocation, leading to additional discards, the RS-IFQ program indicates that many allocation transfers are occurring, which may be used for the harvest of non-targeted red snapper (SERO 2012b).

Preliminary estimates of discards for the 2013 red snapper stock assessment were based on self-reported discard logbooks for pre-RS-IFQ years and excluded any trips where there were zero discards of any species (SEDAR 31 assessment workshop, unpublished data). For RS-IFQ years, discard estimates were constructed from SEFSC reef fish observer program when available or from self-reported logbook data. Stock assessment biologists are still investigating methods to better capture discard behavior and numbers that occur due to RS-IFQ program. Commercial discard estimates were generated by gear type (vertical line, longline), area fished (east, west), and season (open, closed).

Overall, estimated discards during the RS-IFQ program years were considerably less than the years leading up to program implementation (Table 17, Figure 21). On average, 429,671 fish were discarded annually during 2007-2011 compared to an average of 1,080,177 fish discarded annually during 2002-2006. In the eastern Gulf, vertical line discards were comparable before (2002-2006) and after (2007-2011) the RS-IFQ program, with averages near 300,000 fish (Table 17). In comparison, in the western Gulf, average vertical line discards post-RS-IFQ (46,251 fish) were 94% less than pre-RS-IFQ (721,194 fish) (Table 17; Figure 22). For longline gears, in both the eastern and western Gulf, discards were increased post-RS-IFQ (Table 17). Average eastern longline gear discards post-RS-IFQ (64,274 fish) were nearly four times as great as pre-RS-IFQ (15,909 fish) (Figure 22). In the western Gulf average longline gear discards post-RS-IFQ (6,513 fish) were only slight greater than the pre-RS-IFQ years (5,514 fish) (Figure 22).

Additional information pertaining to red snapper discards is available from the SEFSC reef fish observer program. The reef fish observer program began in mid-2006, limiting the data available prior to the RS-IFQ program. SERO (2012b) compared observer data from trips prior to the May 2, 2007 size limit reduction (15 to 13 inches TL) with trips occurring annually after the size limit reduction. A total of 59 observed trips caught red snapper between July 1, 2006, and May 1, 2007, compared to 72 trips from May 2-December 31, 2007, 55 trips in 2008, 66 trips in 2009, 120 trips in 2010, and 151 trips in 2011 (SERO 2012b). The large observed increase in trips starting in 2010 was the result of observer effort being shifted to more longline trips. Previously observed longline trips were less than 20% of all observed trips, but thereafter, longline trips were between 43 to 62% of all trips (SERO 2012b).

Reef fish observer data indicated discard rates in the northern (Florida Panhandle-Mississippi) and western Gulf (Louisiana-Texas) were fewer than discard rates observed immediately prior to implementation of the RS-IFQ program and 13-inch TL minimum size limit. Reef fish observer data indicated 0.76-1.37 red snapper were landed for every discard prior to the size limit decrease on May 2, 2007 (Table 18). After the size limit decrease, an average of 2-4 red snapper were landed for every discard off Louisiana-Texas, whereas an average of 4-7 red snapper were landed for every discard off the Florida Panhandle to Mississippi. The Florida Peninsula was the only area that did not see an increase in the ratio of landings to discards. Discard rates in the eastern Gulf were comparable or slightly greater than pre-RS-IFQ levels.

Reef fish observer data indicate a large proportion of legal-sized red snapper continued to be discarded by both the vertical line and longline fleets (SERO 2012b). In 2011, 3.5 red snapper were landed for every fish released in the vertical line fleet compared to a 0.5 red snapper landed for each fish released in the longline fleet (Figure 23) (SERO 2012b). Discard rates greatly

varied by region. In 2011, 87% of observed red snapper caught in the Florida Panhandle were landed, compared to 79% off Louisiana and Texas, and 47% off the Florida Peninsula (Figure 23). There was also a noticeable difference in the size of red snapper caught, with red snapper along the Florida Peninsula generally larger than fish caught in other areas of the Gulf. Fish 19-24 inches TL were most frequently encountered along the Florida Peninsula, compared to 15-18 inch TL fish off the Florida Panhandle and 15-21 inch TL fish off Louisiana and Texas (Figure 23). Most discards were estimated to be released alive, regardless of gear type used. Discards were likely due to insufficient allocation, rather than the minimum size limit, especially in the longline fleet. Most red snapper caught on longlines were legal-sized and released alive.

Boen and Keithly (2012) conducted a survey of RS-IFQ participants to gauge perceived outcomes of RS-IFQ program implementation. Two questions were asked directly pertaining to bycatch: 1) Has the RS-IFQ program increased the discarding of legal-sized red snapper (13″ TL) and 2) has the RS-IFQ program reduced incidental catch of non-target species? For both questions, survey respondents were on average neutral or indicated bycatch of both red snapper and non-target species may have slightly increased. Medium and large shareholders in the western Gulf agreed that the RS-IFQ program resulted in less bycatch of non-target species, whereas small shareholders and shareholders in the eastern Gulf indicated more bycatch of non-target species occurred after implementation of the RS-IFQ program. Written comments provided as part of survey responses indicated that some participants indicated that one of the more positive aspects of the RS-IFQ program was the reduction in discards, whereas others indicated that an increase in discards as a more negative aspects of the program (Boen and Keithly 2012). This inconsistency is likely explained by the expansion of the red snapper stock into the eastern Gulf and the related increase in catch rates (Boen and Keithly 2012).

3.3.4 Discard Mortality

Reported discard mortality rates for red snapper ranged from 0 to 100% (Campbell et al. 2010) and discard mortality rates depended on fishery sector (e.g., recreational and commercial), gear types, depth fished, water temperature, exposure to thermoclines, handling time, and air exposure. Commercial discard mortality rates used in the last update assessment (SEDAR 7 Update 2009) ranged from 71% in the eastern Gulf to 82% in the western Gulf. Release mortality of red snapper is strongly correlated with depth (SEDAR 31 data workshop, unpublished data).

Reef fish observer program surface-observed discard mortalities prior to May 2, 2007, varied by area fished and gear type (Table 18; SERO 2012b). Prior to the minimum size limit reduction, the percentage of surface observed discard mortalities ranged from 15-33%, but were more variable thereafter. Surface-observed discard mortality rates, unadjusted for depth fished, were comparable pre- and post-size limit decrease off the Florida peninsula (13-17% in 2010 and 2011), but slightly higher off the Florida Panhandle through Texas (22-47% in 2010 and 2011) (Table 18). Surface-observed discard mortality rates by gear were variable from year to year and generally were slightly higher for vertical line gear (22% pre-May 2, 2007 vs. 28-29% in 2010 and 2011) and slightly lower for longline gear (26% pre-May 2, 2007 vs. 14-21% in 2010 and 2011) when compared to rates observed prior to May 2, 2007.

3.4 Social Impacts

As discussed earlier, the RS-IFQ program implemented in Amendment 26 to the Reef Fish FMP was designed to address overcapacity and derby fishing conditions. In addition, it was to provide positive impacts through market stability, a longer fishing season, more flexibility for businesses and improve safety at sea. Here we address some of the revealed social impacts and revisit some of the suggested impacts as a result of the actions in Amendment 26. Some of the expected impacts included: "by reducing fishing capacity, IFQ programs can limit employment opportunities in the fishery, and this can have trickle down effects on small fishing communities where job opportunities are scarce or skills of displaced fishermen are low" (GMFMC 2006). Additional potential impacts include "the fairness of initial allocations that would result in windfall profits to a select few, the reduction of employment opportunities for vessel crew, the effects of the IFQ program on processors, the costs new fishermen would have to pay to gain entry, and the potential for quota to be consolidated in the hands of a select few" (GMFMC 2006).

Overall satisfaction with the RS-IFQ program is tepid according to Boen and Keithly (2012) whose respondents, on average, expressed just above neutral satisfaction with the program. Broken down geographically, those in the western Gulf were more likely to be satisfied, and respondents in the eastern Gulf were more likely dissatisfied. A marked difference between large shareholders and those with fewer shares was also reported with those categorized as large shareholders reporting that they were significantly more satisfied with the program and small shareholders reporting dissatisfaction. Similar results were reported by Tokotch et al. (2012) who surveyed GT-IFQ participants and found that larger commercial operators were more inclined to agree with managers and academics that the GT-IFQ program would produce several benefits for both their operations and the fisheries, in contrast to the smaller operators. They also found that GT-IFQ commercial fishermen and dealers were more skeptical of the alleged overall benefits of the program than those not associated with the RS-IFQ (Tokotch et al. 2012).

3.4.1 Social Impacts from Reduction of Overcapacity

This section addresses one of the program's primary goals: to reduce overcapacity. Overall, the impacts have likely been both positive and negative. In terms of number of vessels and trips, there has been a reduction in vessels and a reduced number of trips since implementation. However, whether these trends can be solely attributable to the RS-IFQ program is unclear. We do know that the absolute number of commercial vessels landing red snapper has declined, so there has likely been some reduction in capacity. The social impacts of such a reduction can be both positive and negative. In terms of reducing overcapacity for the red snapper component of the fishery, there are positive effects; those remaining vessels have fewer competitors and may become more efficient. Yet, for those who chose or were forced to leave the red snapper component of the reef fish fishery as a result of the RS-IFQ program there were likely negative effects. In the first year of the RS-IFQ program, 13% of the former Class 2 and 7% of the former Class 1 shareholders exited the fishery by selling all their shares, resulting in a 10% decrease in shareholders. With the exit of the vessels associated with those shareholders, there was also a concurrent change in catch composition for many reef fish vessels, not just those in the RS-IFQ program. Therefore, we know there has been a change in the composition of species landed by

commercial reef fish vessels because of the RS-IFQ program. Whether there was a concurrent loss of employment as reported in other IFQ programs (AECOM 2010) is unknown. We know that crew sizes have changed since implementation of the RS-IFQ program (Table 8). However, the number of captains and crew who were forced to exit the program as a direct result of reduced capitalization remains unknown. According to Boen and Keithly (2012), there has been a reduction in crew size since implementation. Their respondents reported a statistically significant reduction in the number of crew that was more prominent in the western Gulf and among smaller and medium-sized operations (Boen and Keithly 2012). While there has been a reduction in crew size, there was also a significant change in the ability to hire and keep stable crew, especially in the western Gulf, a change that most respondents indicated has been positive. We are currently unable to measure direct impacts from any reductions in overcapacity at the community level.

3.4.2 Social Impacts from Elimination of the Derby Fishery

The primary effects of eliminating the derby fishery have most likely been positive. The commercial harvest of red snapper is open year round and fishermen can utilize their allocation at any time. Fishermen no longer race to catch fish during the first 10 days of each month, which defined derby fishing. The opportunity to fish at any time has certainly reduced the likelihood that fishermen will fish during bad weather or in unsafe conditions. Furthermore, eliminating the derby fishery has added more flexibility to their yearly fishing seasons, allowing participants to land red snapper when most convenient and profitable. In fact, according to Boen and Keithly (2012) elimination of the derby fishery was one of the most positive impacts of the program. Their survey results indicate that respondents had a mean response of 1.92, which is between strongly agree (1) and agree (2) (Boen and Keithly 2012). With regard to eliminating the derby fishery, the RS-IFQ program has met its objective and has had positive social impacts according to survey participants. As discussed later, safety at sea (See Safety at Sea) has also improved.

3.4.3 Social Impacts from Share Consolidation

The consolidation of IFQ shares after initial implementation of the program has occurred in many IFQ programs, often leading to concern that consolidation may affect the objectives of the plan (Copes and Charles 2004; Gibbs 2007). There appears to have been some consolidation with the RS-IFQ program as 11% of shares were transferred during the first year with an average between 5-8% transferred annually since. With the sale of these shares, there seems to have been a modest increase of 0.03% in median share percentage owned in 2011. Overall, the number of accounts that received shares has decreased from 554 in 2007 to 418 in 2011. While some consolidation may be expected in both the fleet and shares, over-consolidation was one of the concerns during the development of the program. Therefore, provisions were included to place a cap on share ownership to prevent an individual entity from possessing an excessive share of the total. While this provision prevents individual RS-IFQ entities from exceeding the cap, it is not possible to determine whether the cap is circumvented by having others purchase shares on their behalf, as has been reported in other IFQ programs (Carothers 2013). The majority of respondents in Boen and Keithly's (2012) survey agreed that consolidation had occurred in the red snapper component of the fishery. Although we have no empirical evidence, some public

comment has indicated that any further consolidation may be a barrier to access for others and have negative impacts for some communities.

3.4.4 Social Impacts from Market Stability

Market stability was another goal of the RS-IFQ program and it seems to have occurred in general, although volatility with regard to ex-vessel price does exist (Figures 16 and 17). Overall, ex-vessel prices adjusted for inflation have increased over the years, but fluctuate over a given year in response to changing conditions. Market factors like the DWH oil spill, the GT-IFQ program, and seasonal landings seem to play a role in variations in price. Seasonal spikes in red snapper landings seem to indicate that it has become a bycatch species while other substitute species have become primary targets. Seasonal spikes in red snapper landings toward the end of the year signaled the utilization of unused allocation and affected pricing. Overall, respondents to the Boen and Keithly (2012) survey agreed that price fluctuations had stabilized, although those in the western Gulf and medium to large shareholders believed that prices had been reduced as a result. With regard to market value of vessels and gear, respondents to the Boen and Keithly (2012) survey were evenly split in their belief that market value increased overall. That proportion was similar, based upon shareholder size, although, those from the western Gulf were more likely to indicate there was no increase.

3.4.5 Social Impacts from New Participation Roles

Another possible result of IFQ programs is the emergence of new participation roles, such as the development of socioeconomic classes of individuals that control access to the fisheries and those that depend on these individuals for access to the fisheries (Wingard 2000). The structure of the RS-IFQ program, has allowed for the appearance of a new participation role of brokers, those that buy and sell allocation, but do not land red snapper. Brokers may or may not hold shares and through 2011 needed to own a Gulf reef fish permit to purchase shares or allocation. The number of accounts that are only trading allocation has increased from 24% (n = 144) in 2007 to 27% (n = 159) in 2011 (accounts only trading allocation/accounts with allocation, Table 12). Although the increase in the number of accounts only trading allocation is not substantial, it highlights an apparent shift in how people participate in the program. The amount of allocation being transferred from these accounts has increased from 33% of allocation traded in 2007 to 48% of all allocation being traded in 2011 (Table 11). Most of the accounts that are only trading allocation hold shares (n = 99-139), with the nearly 2/3 of these accounts owning a Gulf reef fish permit (Table 12). A small number of accounts (n = 6-20) that do not own shares are only trading allocation (Table 12). Identifying an allocation broker is difficult, as accounts only trading allocation may include accounts that trade allocation to a related account[2] for the purpose of landing red snapper, as well as those that are acting as allocation brokers. The accounts that are only trading allocation may also include both small to large shareholders. Small shareholders may trade all their allocation because it is not sufficient to harvest, whereas large shareholders may trade all their allocation to related account or if they no longer can harvest red snapper (e.g. no Gulf reef fish permit, vessel is being repaired). Therefore, it is unknown at this point, as to whether or not accounts who sell all their allocation fit the category of “sea lords”, those who live off the profits of leasing allocation and not fishing. Nevertheless, it does seem clear that a

category of accounts that only trade allocation has emerged, although the amount of allocation that is being transferred to related or unrelated accounts is currently unknown.

3.4.6 Social Impacts from Perceived Inequalities

According to Boen and Keithly (2012), medium to large sized shareholders believed that their financial condition had improved due to the RS-IFQ program, whereas small sized shareholders believed otherwise. Most shareholders also agreed that it is now harder for others to enter the fishery. Share consolidation and an increase in the number of shareholders not landing red snapper have led to the perception of the development of a new class of "sea lords", those who live off the profits of trading red snapper allocation and not fishing. There are claims that some shareholders now charge their hired crew for the purchase of allocation on the shareholder's vessel, which has increased the costs per trip born by crew. This practice has been reported in other fisheries as well (AECOM 2010). While we have no empirical evidence, the perception among respondents is that entry into the fishery has become increasingly more expensive and difficult, and some believe current hired captains and crew are having more difficulty surviving economically (Boen and Keithly 2012). Pinkerton and Edwards (2009) found similar results in the British Columbia halibut fishery, as did McCay and Brandt (2001) within the Mid-Atlantic surf clam and ocean quahog ITQ program.

3.4.7 Social Network Analyses

In an attempt to better understand RS-IFQ program changes with regard to share and allocation trades, share transfer data were analyzed using social network analysis software UCI net. Figures 24 and 25 depict the share transactions by degree of centrality in 2007 and 2011, the first and fifth years of the RS-IFQ program, respectively. Degree centrality refers to the number of transactions an RS-IFQ account was involved in and is a quick measure of activity within the system. This does not include the volume of shares or prices, just participation in transactions. What is obvious from comparing the two separate years is that a distinct market system has developed for conducting share transactions with participation by a much larger number of RS-IFQ accounts. In 2007, most share transactions involved a few accounts in the fishery who were conducting transactions with a small network of other accounts, primarily small shareholders selling their shares (Figure 24). In 2010, in partial response to the implementation of GT-IFQ, a more well defined network of share transactions developed (Figure 25).

3.5 Community Impacts

Red snapper has been an iconic fish for decades along the US Gulf coast. For some communities it has historically been a significant catch. Figure 26 depicts the top twenty red snapper fishing communities based upon their regional quotient (RQ) in pounds and value ($ per pound) of landed catch for the year 2000. A regional quotient is the proportion of a community's landings for a given species out of total landings of that species for the entire Gulf.

The five communities with the greatest red snapper landings (i.e., the largest RQs) in 2000 were Panama City, FL; Galveston, TX; Golden Meadow, LA; Destin, FL; and Cameron, LA (Figure 26). After a decade, there was little change among the top communities. The top four

communities remained the same (although in different order), while Cameron, LA is no longer among the top 25 communities. Many of the same communities that rank in the top 25 for the year 2000 remain in 2011 (Figure 27), although some are no longer present and new ones appear. There also seems to be greater variation in the relationship between pounds and value in the more recent year than in the past depending upon where landed, which may confound the notion of increased market stability.

A better depiction of the change in regional quotient over time can be viewed in Figure 28, which provides the RQ in value for four years by community, ranked by their average RQ for value over the four years. As shown, the same four communities rank highest in each of the four years (except for 2005), and represent the communities with the greatest proportion of red snapper landings in the Gulf on average. The community of Port Isabel would have replaced Destin in 2005 within the top four, except it did not have landings in 2011, the latest year. The order of these communities within the top four positions has varied over time. Panama City, FL has dropped each year in terms of rank, having its lowest value RQ among the top four in 2008, and nearly the same in 2011 (Figure 29**)**. Cameron, LA was in the top five in terms of regional quotient in 2000 but had no landings in 2008 or 2011.

Recently developed indices designed to understand dependence on both commercial fishing and social vulnerability were applied to a comprehensive set of communities from the RQ figures for red snapper. These indices provide a baseline for understanding current characteristics about each community's engagement and reliance on commercial fishing and social vulnerabilities. With the creation of future indices, we will be able to establish a comparison of change over time that will demonstrate how these communities have adapted to regulatory change.

To better understand how fishing communities are engaged and reliant on commercial fishing, indices were created using secondary data from permit and landings information (Colburn and Jepson 2012; Jacob et al. 2012). Commercial fishing engagement is primarily the absolute numbers of permits, landings, and value. Commercial fishing reliance has many of the same variables as engagement, divided by population, to give an indication of the per capita impact of this activity. Using a principal component and single solution factor analysis each community receives a factor score for each index to compare to other communities. Factor scores for both commercial fishing engagement and reliance for the top eighteen communities from the red snapper commercial fishery were plotted onto radar graphs. Data were not available for Port Bolivar, TX or Matagorda, TX. Each community's factor score is located on the axis radiating out from the center of the graph to its name. Factor scores are connected by colored lines and are standardized, therefore the mean is zero. Two thresholds of 0.5 and 1 standard deviation above the mean are plotted onto the graphs to help determine a threshold for significance. Because the factor scores are standardized, a score above one is also above one standard deviation.

The 0.5 and 1 standard deviation thresholds suggest that several communities are substantially engaged or reliant on commercial fishing (Figure 30). The communities of Apalachicola, FL; Destin, FL; Madeira Beach, FL; Panama City, FL; Golden Meadow, LA; Grand Isle, LA; and Bayou LaBatre, AL all appear to be highly engaged and reliant on commercial fishing overall (Figure 30). Fort Walton Beach, FL is the only community that is neither engaged nor reliant on commercial fishing based upon the lower threshold of half a standard deviation.

Coastal communities were examined using social vulnerability indicators (Figure 31). The three social vulnerability indices are poverty, population composition, and personal disruptions. The variables included in each of these indices have been identified through the literature as being important components that contribute to a community's vulnerability. Indicators such as increased poverty rates for different groups, more single female-headed households, and households with children under the age of five, disruptions such as higher separation rates, higher crime rates, and unemployment are all signs of populations experiencing vulnerabilities. Again, for those communities that exceed the threshold it would be expected that they would exhibit vulnerabilities to sudden changes or social disruptions that might accrue from regulatory change. The communities of Bayou La Batre, AL; Pascagoula, MS; Freeport, TX; Galveston, TX; and Houston, TX exceed the threshold of 0.5 standard deviation above the mean for all three of the social vulnerability indices (Figure 31). The communities of Apalachicola, FL; Panama City, FL; and Golden Meadow, LA exceed the 0.5 standard deviation on two of the indices. It would be expected that these communities may exhibit vulnerabilities to social or economic disruption, including regulatory change. Those communities that exhibit several index scores exceeding the threshold would be the most vulnerable.

3.6 Safety at Sea

In fisheries managed under open access or with insufficiently defined property rights, captains are typically willing to jeopardize the safety of crew members to participate in the race for the fish at all costs, even under dangerous weather and sea conditions (Hughes and Woodley 2007). Under derby conditions, vessels owners feel compelled to plan fishing trips regardless of safety considerations (Thomas et al. 1993). Even under inclement or dangerous weather conditions, several vessel owners schedule trips because if they did not, the fish that they would have caught would be harvested instead by fishermen who chose to be at sea. In contrast, IFQ programs allow fishermen to decrease or eliminate fishing in dangerous weather and sea conditions. IFQ programs are expected to improve safety at sea and working conditions due to the flexibility in trip scheduling, increased duration of the fishing season, and the associated slowed pace of the fishing pace (Grimm et al. 2012). Examples of safety at sea improvements following the implementation of a US-based IFQ program include Woodley (2000) and Hughes and Woodley (2007) who noted that, based on US Coast Guard (USCG) search and rescue missions for the Alaska halibut fishery, there is ample evidence to suggest that the transition to an IFQ program has significantly improved safety in this fishery. Smith (2000) also reported that USCG search and rescue missions decreased by 50% in the first three years of the pacific halibut and sablefish IFQ. In addition, results from a survey of Alaska halibut fishermen indicated that more than 85% of respondents believe that the IFQ program made fishing for halibut safer (Knapp 1999).

Commercial fishermen in the Gulf typically harvest red snapper as a part of a multispecies reef fish fishery. Changes in the annual number of fatalities in the commercial reef fish fishery are therefore used to evaluate safety at sea changes attributable to the establishment of the RS- IFQ program. Changes in the number of fatalities in the commercial reef fish fishery suggest that the implementation of the RS-IFQ program has resulted in safety at sea improvements. The five-year average annual fatalities per thousand days away decreased from 0.050 prior to the implementation of the RS-IFQ program (2002-2006) to 0.017 after the implementation of the RS-IFQ program (2007-2011), corresponding to a 65% reduction. During the same interval, the

five-year average annual fatalities per million vessel days, which accounts for the decrease in the number of vessels following the establishment of the RS-IFQ program, decreased from 0.108 prior to the implementation of the RS-IFQ program to 0.052 after the implementation of the RS-IFQ program, corresponding to a 51% reduction. Annual fatalities per million vessel days recorded in the Gulf between 2000 and 2012 are presented in Figure 32. Results from a recently completed survey of RS-IFQ participants in the Gulf indicate that the industry as a whole is relatively indifferent in terms of the RS-IFQ program impact on safety at sea. However, detailed analyses of safety-related responses by share size ownership and across geographical areas indicate that medium to large shareholders as well as RS-IFQ participants in the northern and western Gulf perceived the RS-IFQ program to have improved safety at sea in the Gulf (Boen and Keithly 2012).

3.7 Enforcement

Law enforcement is a crucial component of the IFQ programs. Agents and officers from NOAA Office of Law Enforcement (OLE) Southeast Division, the USCG and participating Joint Enforcement Agreement (JEA) states enforce the regulated activities mandated under the Gulf IFQ programs. State wildlife officers and game wardens contribute to the enforcement of the IFQ programs under the auspices of the Cooperative Enforcement Agreement, by patrolling the waterfront, meeting vessels upon landing, and monitoring offloads.

Commercial vessels harvesting red snapper are required to have a valid Gulf reef fish permit and a functioning vessel monitoring system (VMS) prior to fishing. VMS units transmit and store information relating to the vessel identification, date, time, latitude/longitude, course and speed, and are able to provide position accuracy to within 33 feet (100 m). VMS units are required to be turned on and properly functioning 24 hours a day, 7 days a week (unless a power down exemption has been approved), even when docked. VMS units provide hourly position transmission and can provide 'real time' position (within 15 minutes) when polled. The VMS protocol contains a requirement that vessels declare their fishing activity and gear type before leaving port ('hail out') via the VMS terminal, NMFS website, or a NMFS call service center. The VMS units improve the efficiency of enforcement efforts (e.g., monitor offshore restricted areas, provide enforcement with a way to monitor offshore restricted areas) and the effectiveness and timeliness of at-sea rescue efforts.

Prior to returning to port, all vessels landing commercial red snapper are required to notify NOAA Fisheries enforcement agents between three hours to twelve hours in advance of the time of landing to indicate where and when the landing will occur, the dealer who will be purchasing the fish, and an estimation of the pounds being landed. Before a landing notification is submitted, the vessel account must contain sufficient allocation for the fish onboard. Landing notifications can be made through the VMS unit, the IFQ online website, or through the call service center. Each time a landing notification is received, law enforcement officers and dispatch personnel are notified via e-mail. The advance notice allows law enforcement agents to be present when the vessel lands to inspect the catch. RS-IFQ vessel can only land at approved landing locations (332 locations as of October 18, 2012). Establishing approved landing sites aids in enforcing the landing and offloading aspects of the RS-IFQ program. All landing locations need to be publicly accessible by land and their geographic location must be

specifically identifiable. Landing sites must be pre-approved by NOAA OLE to ensure agents can find and access the sites. Landing (arriving at a dock, berth, beach, seawall, or ramp) may occur at any time, provided that a landing notification has been given, but fish may only be offloaded between 6 a.m. and 6 p.m., local time. Offloading is defined as the removal of red snapper from the vessel. A landing transactions report is completed by the RS-IFQ dealer and validated by the fisherman. The landing transaction includes the date, time, and location of transaction; weight and actual ex-vessel value of fish landed and sold; and the identity of shareholder account, vessel, and dealer. All landings data are updated in a real-time basis as the landing transaction is processed.

OLE Special Agents conduct random monitoring of vessels, assist state wildlife officers and game wardens with violations requiring further investigation, and conduct independent investigations, primarily those involving the undocumented landing and sale of IFQ species and the trafficking of illegally harvested red snapper and grouper-tilefish entered into interstate commerce. During offshore boardings, the U.S. Coast Guard and JEA partners with long-range capabilities ensure that vessels harvesting red snapper and grouper-tilefish are eligible entities in the Gulf IFQ programs. Major violations since implementation of the RS-IFQ program include the false reporting of species harvested and under reporting of total weights landed. OLE agents enforce regulations with both fishermen and dealers. Typical fishermen violations include:

- landing prior to the three-hour minimum landing notice,
- landing at a location other than specified in the landing notification,
- landing with insufficient allocation, including failure to transfer allocation to the vessel account,
- landing at an unapproved location,
- failure to report or declare an Gulf IFQ species in the landing notification,
- failure to weigh all Gulf IFQ harvested fish,
- selling to a different dealer than listed in the notification,
- transporting a Gulf IFQ species without an approval code,
- selling to an unlicensed dealer,
- completing a landing transaction without a landing notification, and
- offloading after approved hours.

Typical dealer violations include:

- misreporting of Gulf IFQ species,
- failure to provide a current dealer permit and/or Gulf IFQ dealer endorsement, and
- failure to enter Gulf IFQ species landed.

During patrol there was action taken by OLE agents to correct the problems identified throughout the Gulf through educating fishermen on the use of the technology used to monitor the program (VMS and IFQ notification systems). In other instances OLE agents took enforcement action by way of warnings (verbal and written), citations, and some of the violations were turned over to NOAA's Special Agents for follow-up investigation.

The number of federal RS-IFQ related cases has decreased since the start of the program, despite the start of the GT-IFQ program in 2010. In 2011, there were 6 seizures of catches that contained red snapper, with over 6,500 lb seized, relating to a total ex-vessel value of over $26,500 (Table 19). It should be noted that these estimates are only based on seizures by federal agents and do not include seizures completed by state law enforcement. According to Porter, et al. (2013) the number of cases that resulted in a settlement increased post RS-IFQ, whereas those that were declined for prosecution decreased. This increased case resolution may be due to structure of the RS-IFQ regulations, increased enforcement with respect to the RS-IFQ program, or other non-IFQ related reasons (Porter, et al. 2013). Based on surveys in 2011, a majority of respondents believed that the enforcement and compliance of the RS-IFQ program has increased in the past five years and only a small percentage (13%) responded that they routinely violate fisheries laws (Porter, et al. 2013). With respect to dockside enforcement, nearly 33% of respondents believed that the dockside enforcement (i.e. number of agents, number of inspections, and effectiveness) was inadequate and it was easy to evade dockside detection (Porter et al. 2013).

IFQ administrative staff regularly audit landing notifications and transactions. Audit letters are sent to dealers and fishermen notifying them of outstanding transactions. If transactions are not completed or are considerably late, they are referred to NOAA OLE for further investigation. Beginning in 2011, letters were sent to dealers who were specified in landing notifications but did not have corresponding landing transactions. In 2011, letters were sent to dealers for 67 notices that reported landing red snapper but did not have corresponding landing transactions. Of these, 46 outstanding landing transactions were completed or a reason why a landing transaction was not entered was provided. In 2011, 18 outstanding landing notifications that reported landing red snapper were referred to OLE. To date in 2012, letters have been sent to dealers for 98 landing notifications to resolve missing landing transactions and dealers have been called regarding an additional 34 outstanding notifications. Of these, 68 have been resolved, 25 are in the process of being resolved, and 39 have been referred to OLE.

3.8 Program Administration

3.8.1 Changes to the RS-IFQ Program

The RS-IFQ database and online system were relatively unchanged until 2010. In 2010, significant online and database structural changes were made with the implementation of the GT-IFQ program. These changes simplified the analysis and management of the data and allowed for the same system to be used by both the RS-IFQ and GT-IFQ programs, as many of shareholders and dealers participated in both programs. In 2010, the system changed to a vessel account based system that took the place of the fishermen-assignee account system. Vessel accounts are associated with one vessel and belong to a shareholder account, versus the fishermen assignee system where individuals working on a vessel were related back to a shareholder account. In the new system, each vessel landing red snapper is required to hold sufficient allocation prior to landing. The previous system allowed a vessel to land under multiple shareholder accounts and all allocation was held in the shareholder account. Additional changes that occurred in 2010 were the elimination of the ex-vessel value report as this information is readily available online, the elimination of the letter sent to dealers delinquent in

paying the cost recovery fee, the creation of a landing transaction correction form, the ability to complete share transactions online, the required pre-approval of all landing locations, and the creation of a share/allocation calculator. In 2011, administrative changes included clarifying the definition of ex-vessel prices, updating the website to include share and allocation ledgers, requiring a certification of citizenship for all shareholders, and a video tutorial on how to update your account. In 2012, the administrative changes included public participation in the program (allowing the public to buy or sell shares and allocation), the creation of dealer ledgers, allowing managers to enter comments in the landing notifications to aid law enforcement about atypical landing notifications, finalizing a process to close an IFQ account, and finalizing procedures in the event of a death of a shareholder. As needed, the administrative staff updates the Frequently Asked Questions (FAQ) and Troubleshooting document, creates annual reports, and provides important messages about the IFQ system to participants. In the upcoming year, administrative staff will be upgrading the database and online system to enhance performance and develop mobile applications for the online system.

3.8.2 Cost Recovery and Expenses

The Magnuson-Stevens Act requires the Secretary to adopt regulations implementing a cost recovery program to recover the actual costs of managing, administering, and enforcing the Gulf IFQ programs. Monitoring costs are the costs associated with determining how many fish are harvested, when harvest occurs, where harvest occurs, issuing quota, transferring quota, etc. The administrative costs are the costs associated with IFQ personnel, customer service, travel, call service contracts, and mail outs. The enforcement costs are the costs associated with ensuring the harvesting vessels and fish buyers are in compliance with the existing regulations governing the harvest. The cost recovery fee established for the RS-IFQ program is currently 3% of the actual ex-vessel value of Gulf red snapper. RS-IFQ allocation holders who complete a landing transaction with a dealer are responsible for payment of the fee. The dealer who receives the red snapper is responsible for collecting and submitting the fee on a quarterly basis. Monies collected are used for administration of the program, maintenance and upkeep of the online system and software, enforcement of the RS-IFQ program, and scientific research.

Because nearly the entire red snapper commercial quota is landed each year, quarterly total ex-vessel values and the associated cost recovery fees are correlated to the quota. Cost recovery monies decreased when the quota was reduced in 2008 and 2009, and subsequently increased when the quota was increased in 2010 and 2011 (Table 20). A total of $1.45 million dollars has been collected through cost recovery fees during the first five years of the program.

Task codes are used to track salaries and benefits, contracts, equipment and software purchases for the cost recovery expenses, as well as research activities and law enforcement activities directly related to the RS-IFQ program. Additional funding for law enforcement and program administration is provided through the general NOAA catch shares annual funding. Expenses summarized here include only those expenses incurred between January 1, 2007, and December 31, 2011. Expenses for program development by the Council and NOAA Fisheries Service pre-2007 are not included. Additionally, due to implementation of the GT-IFQ in 2010, some expenses (i.e., observers/research, law enforcement) are now jointly associated with one another and cannot be distinguished for tracking against the RS-IFQ versus GT-IFQ. To determine the

proportion of expenses associated with the RS-IFQ, the total value reported for each program in 2010 and 2011 was used to apportion expenses. In 2010 and 2011, the RS-IFQ accounted for 41.8% and 35.4% of the total value of the RS and GT-IFQ programs combined. Total costs expended for observers in 2011 ($192,000) and law enforcement in 2010 ($257,323) and 2011 ($268,328 for JEA related enforcement and $593,485 for targeted IFQ enforcement) were multiplied by the above percentages to estimate expenses associated with the RS-IFQ.

During the first five years of the program at total of $2.31 million dollars was spent on administering and enforcing the program. This represents 4.8% of the total value of fish reported during the first five years of the program. However, because not all expenses exceeding the 3% cost recovery are tracked, and administrative expenses pre-2007 are not included, expenses likely are greater than those provided here.

Figure 33 provides a breakdown of IFQ program expenses during the first five years of the program. Most expenses were associated with IFQ enforcement (52% JEA; 9% targeted enforcement), followed by salaries and benefits (30%), supplies/materials/computer equipment (3%), additional at-sea observers (3%), rentals and contracts including the Call Service (2%), and travel (0.4%).

3.8.3 IFQ Customer Service

NOAA Fisheries is responsible for maintaining IFQ program customer service. Customer service staff are available from 8 a.m. to 4:30 p.m. EST Monday through Friday. Four staff members assist in answering phone calls, auditing and correcting IFQ data, preparing IFQ annual reports, conducting workshops and meetings, and preparing IFQ materials for dissemination to constituents. Two additional Information Technology staff work full- or part-time to maintain and upgrade the IFQ online data collection system. Additionally, NOAA Fisheries contracts out phone-based IFQ landing notifications to an after-hours call service. The call service typically answers 600-1,000 minutes of phone calls each month.

One aspect of the administrative duties is to provide outreach opportunities for participants in the program. Outreach activities include visiting dealers for face-to-face question and answer meetings, public meetings to address RS-IFQ participants, fishery bulletins to inform participants about changes, updating trouble-shooting guides and frequently asked question documents, and posting messages on the RS-IFQ website (Table 21). For cost effective management, dealer visits are often scheduled around the same time as public meetings to reduce travel costs.

Boen and Keithly (2012) conducted a survey of RS-IFQ participants to gauge their level of satisfaction regarding the IFQ online system and customer service. In general, responses indicated satisfaction with regards to the IFQ online system, customer service when contacting NOAA Fisheries, and customer service while making landing notifications by phone. Despite indicating overall satisfaction with customer service, some respondents to the survey indicated the online computer system was difficult for some people to use, especially those that are not computer literate.

3.8.4 Data Collection and Reporting Issues

The Gulf IFQ programs collect a variety of data from participants that are used to analyze the program performance. Price information is a crucial portion of the economic evaluation of the program, and yet the program continues to have price collection/reporting issues with respect to share transfers, allocation transfers, and ex-vessel prices. Recently, public meetings were held to discuss the importance and need for accurate recording of price information. Participants stated that reasons for misreporting or not reporting prices come from a variety of sources:

- privacy concerns,
- trading to a related account,
- bartered trades (e.g., bartering red snapper shares/allocation for grouper-tilefish shares/allocation),
- combined package deals (e.g., vessel, permit, and shares bought for a single price), and
- misunderstanding of what price should be entered (i.e., total vs. price per pound).

Industry participants believed that privacy was the main reason for inaccurate price information, followed by bartering and trading among related accounts. Package deal transactions (i.e., sale of quota with a vessel, permit, other goods, etc.) do not occur as frequently and in later years the website has been modified to reduce confusion about total price versus price per pound paid. Comments and suggestions from the public meetings will be considered as NMFS develops modifications to the IFQ data reporting system to improve price reporting.

Share transfer prices were not required from 2007-2009, but since mid-year 2010, a minimum transfer price of $0.01 has been required for all share transfers. Despite requiring participants to enter a total price for share transfers, in 2011 14% of the share transactions had the default total value of $0.01. The percentage of share transactions with a plausible price (price per pound equivalent[10] was between $9 and $36) entered has decreased in the last two years of the program, and in 2011 (Table 14). Because all shares transfers are recorded as an individual transfer, there is no current method to record bartered trades. Allocation transfer prices are currently not required by the online system (e.g., a zero value may be entered). Since the program's start, between 20-35% of the transactions included a plausible price (price per pound between $2.60 and $5.50) (Table 15). Ex-vessel prices have varied considerably since the start of the RS-IFQ program, with values ranging from $0.01/lb to $5.75/lb (Figure 34). These widely varying prices are primarily attributable to different reporting practices by dealers. However, differences in retail markets and landing season can also affect the ex-vessel price paid to the fishermen. Extremely low prices have been attributed to dealers reporting ex-vessel prices after deducting for transferred or leased allocation, goods (e.g., bait, ice, fuel), and/or services (e.g., repairs, machinery replacement). The definition of actual ex-vessel price was changed through regulations in June 2011 and prohibits the costs of allocation transfers, goods, and/or services from being deducted from ex-vessel prices. Despite the new regulation in 2011, ex-vessel prices in many instances continue to be under-reported through the RS-IFQ online system.

[10] A price per pound equivalent is the share percentage that would equal one pound for that particular time period. The exact share percentage that is equivalent to one pound depends on the total commercial quota and will change as the quota changes from year to year or within a year for any quota increases.

An average imputed ex-vessel price was calculated for each quarter. To calculate actual (imputed) versus reported ex-vessel revenue, all extremely low ex-vessel prices were replaced with the appropriate imputed ex-vessel value. This new dataset was used to calculate the actual ex-vessel revenue. Revenue differences increased during the later RS-IFQ years, when under-reporting of ex-vessel price was more prevalent (Table 22). Using the imputed values, ex-vessel revenue was under reported in 2010 and 2011 by around $2,000,000 (Table 22).

3.9 Sector Allocations

The Magnuson-Stevens Act does not require the five-year review to include review of sector allocations. However, the NOAA Catch Share Policy specifies that allocations should be reviewed on a regular basis. Further, National Standard 4 guidelines described in 50 CFR 600.325 indicate each fishery management plan should contain a description and analysis of the allocations existing in the fishery and the effects of eliminating an existing allocation scheme. In setting or revising allocations, an allocation of fishing privileges must be fair and equitable, reasonably calculated to promote conservation, and must avoid an entity from acquiring excessive shares. The Council can also consider other factors relevant to the fishery management plan's objectives when setting allocations.

SEFSC staff presented an analysis evaluating the economic efficiency of red snapper allocations at the October 2012 Socioeconomic Scientific and Statistical Committee (SESSC) meeting. A presentation and report (Agar and Carter 2012) were also provided to the Gulf Council at their October 2012 meeting. Results from the analysis suggest that the 2012 allocations (51% commercial: 49% recreational) are not economically efficient because the willingness to pay for an additional unit of quota is higher in the recreational sector relative to the commercial sector. However, the magnitude of the reallocation and the extent to which societal benefits can be increased can only be confidently determined with additional research, improvements in the quality of existing data collections, and new data collections. On the commercial side, improving the quality of allocation and share prices was considered critical to the analysis as they provide valuable information on the willingness to pay for an additional unit of quota as the commercial sector adjusts to the current RS-IFQ regime. Agar and Carter (2012) provide additional results and information regarding the economic efficiency of red snapper allocations.

4.0 Research Needs

4.1 Biological

Biological research needs that aid in stock assessments are vital to determine how the RS-IFQ program is affecting the population, particularly as the behavior of the fishermen change in relation to the RS-IFQ program requirements. Many of the recommendations below result from recommendations of the current stock assessment. Exploring ways in which to ensure that the RS-IFQ landings and the trip ticket landings match would add increased confidence in final landings used in the assessments, as well as aid OLE agents and IFQ support staff in determining unreported Gulf IFQ landings. Having a closer integration between the reef fish observer program and the Gulf IFQ database would aid in determining the amount of allocation available at any given trip and its relation to discarded fish as well as the effects of social and economic impacts on fishermen behavior in terms of fish discards. Prior to the RS-IFQ program red snapper were discarded due to closed seasons or size limits, but now fish may be discarded due to low allocation, the need to make allocation last year-round, or dealer-specific size preferences (i.e. plate size fish). Further investigation is needed into how the CPUE changed after the implementation of the RS-IFQ program, and how to best incorporate that into the stock assessment model.

4.2 Economic

Economic research and data collections are vital to gauge the performance of catch share fisheries. In the course of this review, several priorities were identified. First, while there are several on-going efforts, greater attention must be paid to the timely collection of accurate dockside, allocation and share prices and the development of a framework to understand and categorize the various types of transactions (e.g., barter, arm length transactions). This is research is particularly pertinent to monitor changes in economic performance for the upcoming grouper-tilefish IFQ review. Second, additional research (and potentially legal advice) is required to identify the economic entities that effectively control shares and allocation. This research will allow the agency to better monitor share caps and changes in concentration and market power. Third, there are number of data collections that would benefit from closer integration. For example, linking the IFQ database with state trip tickets, coastal logbook, and VMS database would permit the development of richer economic models to monitor changes in overcapacity, fishing behavior (e.g., species targeting; effort deployment, entry-exit decisions, etc.) and profitability. In addition, the current economic add-on to the coastal logbook is not structured to collect representative cost data from catch share fisheries, which limits its usefulness for this type of review. Fourth, data collections that describe the linkages between the harvesting and retail sectors, and changes in capital stock (e.g., vessels and gear) and hired-captain, crew dynamics, and remuneration, would allow the development of models to understand the impact of market conditions (e.g., inventories, imports) on prices and production, investment and dis-investment decision-making, and distributional impacts brought about IFQs programs.

4.3 Social and Community

A comprehensive study of the social impacts resulting from implementation of the RS-IFQ program has not been conducted due to limitations of time and personnel. Potential questions to examine, should the resources become available, include:

- How have fishing communities and fish houses been affected by the RS-IFQ program? Develop finer measures of IFQ dependency and change with regard to red snapper and other species managed under IFQ programs and fisheries not under IFQ.
- Has the RS-IFQ program affected the quality of captain and crew jobs and how? Has there been a change in well-being, compensation, or availability of work? Collect data on crew and hired captains that will allow measures of social and economic well-being.
- How have roles of participation changed? Evidence suggests that there are now entities whose role as "brokers" entails only buying and selling shares and allocations. What impact has this had on fishermen and access to allocation?
- Examine data on share and allocation ownership and trades over time to measure trends in activity and possible impacts on participation both within and outside the Gulf IFQ programs.

4.4 Enforcement and Safety

During fiscal year 2011-2012 (ended 12/31/12) NOAA funded enhanced enforcement of the IFQ programs. Enhanced enforcement was needed to address complaints received throughout the Gulf that referenced the Gulf IFQ programs. The funding for enhanced patrol focused OLE agents' attention on IFQ-related enforcement, and therefore resulted in a higher compliance rate. With the expiration of the enhanced IFQ patrol funding from NOAA, Florida Fish and Wildlife Conservation (FWC) will now incorporate IFQ patrols along with various daily duties. The patrol efforts are not as concentrated on the IFQ program because the FWC officer is tasked with multiple responsibilities during normal patrols. FWC is always seeking additional funding opportunities to better protect the natural resource of the state of Florida.

Based on the results from the study in Porter et al. (2013), increased enforcement for dockside inspections may be needed to maintain or increase the rate of compliance. Additionally, Porter et al. (2013) suggested that additional research be funded that would aid in determining the relative importance of internal and external IFQ related factors (e.g. change in ex-vessel price, increased quota, VMS requirements) with respect to compliance to the regulations.

5.0 Recommended Program Changes

5.1 Ad Hoc Red Snapper IFQ 5-year Review Advisory Panel Recommendations

The Gulf Council appointed an Ad Hoc RS-IFQ 5-year Review Advisory Panel (AHRS-AP) to assist in the 5-year review of the RS-IFQ program. The AHRS-AP includes commercial fishermen, private recreational anglers, for-hire operators, academics, and a non-governmental organization (NGO) representative. The AHRS-AP formulated its recommendations during its July 2011 meeting.

The AHRS-AP's principal recommendation to the Gulf Council was to address the opening up of RS-IFQ shares for sale to the general public. This issue was also expressed through a concern that fish allocated to the commercial sector should remain within the commercial sector to provide the American public with marketplace access to this source of protein. The RS-IFQ provision allowing the transfer of shares to any citizen or permanent resident alien took effect January 1, 2012 as initially scheduled. To mitigate potential impacts of the free flow of shares and allocations on the commercial sector, the AHRS-AP recommended that the Gulf Council:

- establish a 15% cap on of any shareholder's annual allocation that can be leased outside of their respective commercial or recreational sector in any given calendar year,
- prevent any one vessel from landing more than 4% of the commercial RS-IFQ quota, and
- limit the amount of red snapper quota a new entrant without a reef fish permit may possess after January 1, 2012, to 0.25% of the commercial red snapper quota.

The AHRS-AP also requested that the Gulf Council address inactive or unused shares. The AHRS-AP suggested that the Gulf Council should redistribute annual allocation from shares held by those without a commercial reef fish permit if allocation from shares are not transferred to a licensed reef fish permit holder by September 1 of each year. The AHRS-AP also recommended redistributing unused RS-IFQ shares to other active shareholders if 75% of an account's RS-IFQ allocation is not landed or transferred to an active reef fish permitted entity two out of three consecutive years. Lastly, the AHRS-AP recommended proportionally redistributing any shares and current allocation in RS-IFQ accounts that have never been activated or have remained inactive for four consecutive years among current RS-IFQ shareholders. The AHRS-AP suggested that the Gulf Council (and NOAA Fisheries) notify inactive shareholders within a reasonable timeframe, giving them time to sell their shares and allocation, before redistributing the shares if no action is taken.

Additional recommendations provided by the AHRS-AP requested that the Gulf Council reconvene the AHRS-AP to develop options to distribute commercial quota associated with a total allowable catch level above 9.12 million lb with consideration for new entrants, bycatch, and for current commercial and recreational participants. Finally, the AHRS-AP recommended that the NOAA Office of Law Enforcement send an e-mail confirmation of trip declarations and NOAA Fisheries send an email confirmation of reported 3-hour landing notifications to vessel owners.

5.2 SESSC Recommendations

During their October 2012 and January 2013 meetings, the SESSC received several presentations on the five-year review of the RS-IFQ. Presentations included a summary of the 2011 red snapper annual report produced by SERO, RS-IFQ landing and effort trends, market concentration analyses, and allocation analyses completed by the SEFSC, and results of a stochastic distance analysis evaluating changes in fishing capacity and technical efficiency.

The SESSC indicated the data and descriptive analyses provided in the review document suggest that, theoretically, expected outcomes following the implementation of an IFQ are being achieved in the fishery and the RS-IFQ program is meeting its objectives. The SESSC recommended that more specific and quantified program objectives be identified prior to future program evaluations. In addition, the SESSC acknowledged the multispecies nature of the reef fish fishery and highlighted the challenges posed by a review limited to a single species, i.e., red snapper. To more accurately assess the impacts within the multispecies context of the reef fish fishery, the SESSC recommended that future reviews be based on the decision making units (e.g., vessels, vessel owners, shareholders, etc.) rather than on a specific species such as red snapper. The simultaneous review of the RS-IFQ and GT-IFQ programs would constitute an improvement in this direction, or to the extent possible a review at the fishery (Gulf reef fish) level, which would include non-IFQ managed species. Potential modifications to the RS-IFQ proposed by the SESSC would address the shares held by inactive accounts and would possibly consider a redistribution of those shares to active participants or new entrants. The SESSC also recommended that emphasis be placed on bycatch reduction, especially in the eastern Gulf, measures to improve the accuracy and quality of price data collected be implemented, that alternative distribution methods of RS-IFQ shares with an increased commercial quota be evaluated, and that an assessment of capacity be conducted. The capacity assessment would measure changes in capacity, overcapacity, and excess capacity. The SESSC also recommended that funding be increased to provide for additional data collection, particularly with respect to the onshore sector. This additional data would expand the analyses to include assessing impacts on other stakeholders (e.g. non-participants, dealers, processors, other fishing businesses, and communities) and allow for a more comprehensive analysis of social impacts in general. Finally, while recognizing that this review is the very first attempt at an IFQ program review in the Gulf, the SESSC recommended that the Gulf Council consider the establishment of a more formal process for review including clear terms of reference specifying what is included in the review, how public input on the review is solicited, and AHRS-AP and SESSC meeting timelines and expected outcomes.

5.3 NMFS Administrative Changes Based on IFQ Workshops

NOAA Fisheries conducted four workshops regarding price reporting and Gulf IFQ programs administrative changes during September and October 2012. The purpose of the workshops was to clarify existing regulations and seek feedback regarding price reporting and administrative changes in an effort to provide added flexibility to participants and enhance enforceability of the program. Workshops were held in New Orleans, Louisiana; Galveston, Texas; Madeira Beach, Florida; and Panama City, Florida and had between 8 and 20 attendees, including Gulf IFQ participants, industry representatives, and a port sampler.

5.3.1 Price Reporting

At these workshops, RS-IFQ staff discussed the importance of accurate price reporting, the high number of missing or under-reported share, allocation, and ex-vessel prices, and the potential reasons behind these prices, and possible solutions. Feedback from the industry indicated that privacy of reported prices was very important and participants did not want to be forced to enter price information. In addition, many attendees indicated that bartering frequently occurs with allocation transfers. Workshop attendees did not believe that adding pop-up boxes to confirm price data in the electronic reporting system or completing a mail-out to confirm past prices would be worthwhile. However, participants were comfortable with making modifications to the electronic reporting system that would include drop down boxes explaining the rationale for a reported price. Proposed rationales would include sale to another shareholder, transfers to a related account, bartered for allocation or shares, gift, package deal, or no comment.

Constituents at the workshops were very interested in sector allocation (commercial vs. recreational) and how price data will be used to determine the allotted total allowable catch for each sector. Workshop attendees were concerned that misreported allocation and share prices would be used for the calculation of sector allocations. Additionally, workshop attendees requested that NOAA Fisheries post a FAQ sheet together on this subject.

Additional feedback concerning prices included a recommendations to charge a leasing fee for people who sell allocation to other shareholders, to allow cost recovery feeds to paid more frequently, rather than be restricted to quarterly payments, and a revision to the landing transactions to allow goods and services to be included in ex-vessel prices.

5.3.2 Administrative Changes

The administrative changes to the Gulf IFQ programs that were presented at the workshops were based on constituent and law enforcement feedback received by SERO and recommendations from the Law Enforcement Advisory Panel's (LEAP) July 2012 meeting. Suggested changes included changes to landing notifications, offloading requirements, and landing transactions.

5.3.2.1 Landing Notifications

Suggested landing notifications modifications were:

- Expand information included on the landing notification to include the captain's name, phone number, start of trip, and trip type (single vs. multi-day)
- Specify a landing interval (e.g. 30 minutes) which would not require a new notification
- Allowance to land early under the authorization of an OLE agent at the landing site
- Specify a process to amend landing notifications (e.g. when an additional 3 hours is required)
- Allowances for multiple landing notices to be entered on a single landing notification
- Consideration of expanding landing notification timeframe from 12 to 24 hours
- Require any vessel with a Gulf IFQ account to complete a landing notification

The addition of the captain's contact information on the landing notification information would allow OLE agents to contact the person onboard the vessel, whom may be different from the shareholder, whereas the additional trip information would aid in reconciling differences between the RS-IFQ data, SEFSC coastal logbook program, and dealer trip ticket reports. Additionally, the identification of single day trips would aid in auditing differences between estimated landings and actual landings, as due to the minimum 3-hour notification requirement many single day trips estimated landings prior to the completion of fishing. OLE agents believed that requiring any vessel with a Gulf IFQ account to complete a landing notification would aid in the prevention of illegal offloading of IFQ species.

Most workshop attendees opposed this additional information for the following reasons:

- Captain's name could be added to IFQ vessel account
- Captains may change frequently
- Already report trip start and end dates elsewhere
- Cost if reporting through the VMS unit, particularly with increased size or frequency of messages

Currently, there is no specific regulation indicating when a vessel may land during their notification window, although landing earlier then the time indicated is prohibited. Clarifying the time period during which a vessel can land would allow consistent enforcement of regulations among all participants. Attendees were concerned that a 30-minute grace period was too short, were in support of verbal confirmation to land early, and would prefer an established method to modify or amend submitted landing notifications.

Current regulations do not clearly state when a notification can be amended without a vessel having to wait an additional three hours to land. A main reason for the landing notification is to allow OLE agents sufficient time to arrive at the landing site to inspect the catch. The suggested clarification for the regulations would include new notifications requiring vessels to wait a minimum of 3 hours when the landing location changes or the vessel specifies an earlier landing time. If the location of landing remains the same, but the vessel specifies a different dealer, later landing time, or revised estimated weights, then an amended notification would need to be submitted but the vessel would not have to wait an additional 3 hours to land.

Additional comments about landing notifications included issues with the call service line and infrequent VMS updates. Participants were encouraged to contact IFQ Customer Support the next time they experienced a problem with the call service line, so that we may resolve the problem and prevent it from happening in the future. RS-IFQ staff is aware of the delay in VMS updates and are working together with OLE and VMS staff to find a solution (e.g. use of text boxes instead of drop down boxes that need frequent updates).

5.3.2.2 Offloading

Suggested offloading and landing transaction modifications were:

- Extend offloading timeframe until 9pm, if offload begins prior to 6pm with an OLE agent's permission
- Required presence of captain during offloading
- Restricting *all* offloading to RS-IFQ regulations if any IFQ species is onboard
- Use VMS to declare an IFQ trip and any declared IFQ trip must abide by IFQ regulations regardless of catch
- Specify that offloads must occur within X hours (e.g. 96 h) of landing

Extending the offloading timeframe would add more flexibility to dealers and fishermen who are often tide-dependent when offloading a vessel, but still allow an OLE agent to inspect a vessel at any time. OLE agents were concerned about the extended timeframe allowing for illegal offloading of IFQ species, and workshop attendees were concerned about a lack of IFQ Customer Support during that timeframe. Attendees requested that IFQ Customer Support have an after-hour phone line, particularly for those in the central time zone.

Fishermen may leave the site during offload and OLE agents determined that requiring the captain's presence during offload would aid OLE agents if there was a problem with the offload or landing transaction. Many attendees stated that the captain was usually present during offload, but should not be required because the captain may have to leave as soon as the vessel lands.

Generally, workshop attendees were supportive of prohibiting vessels from offloading non-IFQ species after IFQ offloading hours when IFQ species are onboard, and in fact some attendees also recommended that commercial reef fish offloading hours be changed to match IFQ regulations. By adding the VMS IFQ trip declaration capability OLE agents would be better able to plan their day and identify vessels that should and should not have IFQ species onboard. Participants did not oppose adding an option for selecting an IFQ trip when declaring the start of a trip through VMS, but believed that fishermen may always declare a generic commercial reef fish trip instead of an IFQ trip.

Attendees provided mixed responses with regard to restricting when fish could be offloaded after a landing. Some attendees opposed this because of business practices (e.g., transactions entered at the end of the day), because they wanted to maintain product freshness until fish were sold, or because high volume of vessels needed to be offload (e.g. particularly during holidays). Some attendees suggested an alternative creation of an offloading notification and requiring that a landing transaction be made within X hours after the offloading notification.

5.3.2.3 Landing Transactions

Suggested modifications to landing transactions were:

- Landing transactions must be completed immediately upon offload

- Prohibit ice/water weight from being deducted from landing transactions
- Clarify language about landing transaction occurring *after* landing (no at-sea transactions)
- Removal of inactive landing sites

Dealers are responsible for completing a landing transaction report at the time of the transaction, however there is no restriction on when fish must be offloaded after a landing notice is made. Some landing transactions have been completed as much as 1-3 weeks after the landing occurred. Proposed regulations would consider limiting the timeframe for completing a landing transaction. Defining a time period would:

- Contribute to more accurate up-to-date landings,
- Reduce the opportunity for a fishermen to go over his allocation (e.g., if the landing is not deducted immediately, the fishermen may believe they have more allocation available),
- Aid in identifying which catches were never landed (e.g., mismatch data between notifications and transactions) for enforcement purposes.

Dealers, primarily in Texas, have been deducting 2-3% of the weight of IFQ species landed before completing a landing transaction. According to dealers, the practice of deducting water/ice weight from total fish weights has been a common practice since prior to the IFQ program, although there are inconsistencies and no standardized amount that is deducted. Attendees indicated that between 1-4% is standard for the weight removed for ice and water weight in a landing transaction. Dealers already deducting ice/water weight were supportive of standardizing deductions for ice/water weight, whereas those not deducting ice/water weight believed this practice should be prohibited. It was recommended that a simple study be conducted to determine the appropriate ice/water weight deduction for fish landed.

The language in the regulations is not overly specific as to requiring the vessel and fish to be at the dock before the transaction is entered. The language does say "at the time of the transaction," which does not preclude the transaction from occurring while the vessel is at sea. The information required in the report does include the weight of the fish "landed," and because a vessel has yet to land it certainly argues against allowing a landing transaction at sea. Additionally, landing locations must be approved and those do not include at sea locations, so a vessel cannot report a weight of fish landed at an approved location when the fish are still at sea. Regulations may need to be clarified to prohibit landing transactions at sea.

Current regulations provide specific criteria for the approval of landing locations but not for the removal of site. Review of landing notifications indicated approximately 70 of 332 landing locations have not been used since January 2010. This would aid law enforcement by limiting the number of sites that would potentially have to be enforced. Attendees were generally supportive of removing unused landing locations whereas others suggested that unused location be retained in case of emergencies. One attendee mentioned that he keeps additional landing

locations on record for when there are extreme low tides and he cannot reach his other locations. Attendees suggested that we contact the person who submitted the location before removing it.

Attendees recommended making the correction form an online process, where the dealer and shareholder can enter their personal identification number (PIN) to confirm a landing correction, rather than printing out the form and mailing it in. Grading fish is common practice throughout the Gulf and many attendees would like to be able to account for this in one landing transaction. IT staff is currently examining how to integrate these suggestions into the current database and website structure.

5.3.2.4 Next Steps

Based on the input summarized above and LEAP recommendations, NOAA Fisheries intends to develop a rule containing proposed IFQ administrative changes. NOAA Fisheries intends to publish this rule later this year and will seek additional input from constituents and IFQ participants before moving forward with any changes to administrative regulations.

6.0 Review Summary and Conclusions

This report represents the Gulf Council's first comprehensive review of the RS-IFQ program. The review is required by the Magnuson-Stevens Act and is intended to determine progress in meeting RS-IFQ program goals and any necessary modifications to the program to better achieve those goals. The two primary goals of the program were to: 1) reduce overcapacity and 2) eliminate problems associated with derby fishing (i.e., market gluts, seasonal closures, reduced safety at sea, etc.). The following summarizes the main conclusions of this review and recommendations identified by the Gulf Council and their advisory bodies during the evaluation.

Participant Consolidation and Overcapacity

Overcapacity refers to the maximum amount of landings over a period of time that can be produced by a fishing fleet if fully utilized given the exiting biomass and available technology. Overcapacity is the difference between capacity and a desired output level (i.e. quota). In the case of red snapper, overcapacity led to short fishing seasons, derby-style fishing conditions, market gluts, and low ex-vessel prices. Stochastic frontier analyses indicate that fishing capacity has declined since the beginning of the program. However, the remaining fishing capacity remains large relative to the available commercial quota. Solis et al. (2013) estimated that 61 commercial vessels could harvest the entire commercial red snapper quota. In addition, shares are highly concentrated (29 accounts hold 61% of the quota shares), but the market remains competitive. Since implementation of the RS-IFQ program, there has been a 22% decrease in shareholders, but the number of allocation holders has remained largely unchanged due in part to the implementation of the GT-IFQ program in 2010. There has also been a small increase in the number of dealers as fishermen shift toward smaller dealers and fully integrated business plans (owner, operator, and dealer). Fishermen perceive consolidation has occurred, mostly with smaller shareholders (Boen and Keithly 2012).

> Conclusion 1: The RS-IFQ program has had moderate success reducing overcapacity, however economic analyses indicate that additional reductions in fleet capacity are still necessary.

Achievement (or Harvesting) of Optimum Yield

Commercial landings that equal or are very close to the quota without exceeding it would be consistent with the preventing overfishing and achieving OY as mandated by the Magnuson-Stevens Act. The performance of the IFQ program in achieving the harvesting of OY can be assessed by measuring its ability to constrain harvest at or below the quota while allowing IFQ participants to harvest as much red snapper as possible.

Since implementation of the RS-IFQ program, there have been no overages of the quota. Pre-RS-IFQ, the commercial quota was exceeded in 11 of 17 years. Since the implementation of the RS-IFQ, between 95-98% of the commercial quota harvested annually. Remaining allocation at the end of each fishing year is largely held by inactive shareholders. At the end of 2011, there were 102 inactive accounts with red snapper allocation totaling 1.5% of the quota. Despite numerous attempts by NMFS to contact inactive account holders, many accounts continue to

remain inactive. Although these inactive accounts result in less fish being harvested, providing a biological benefit to the stock, they reduce the fleet's ability to harvest the entire commercial quota.

> Conclusion #2: The RS-IFQ program has been successful in reducing quota overages, which is consistent with the achievement of OY. Landings have averaged greater than 95% of the commercial quota; however, many inactive accounts remain and account for as much as 1.5% of the commercial quota.

Mitigating the Race to Fish and Safety at Sea

Prior to the RS-IFQ program, the commercial season ranged from 52-131 days. Fishing seasons were short as fishermen raced to harvest red snapper during the first 10 days of each month. Derby-style fishing conditions led to short seasons, excess discards of undersized red snapper, low ex-vessel prices, market gluts, and inefficient harvesting practices. After implementation of the RS-IFQ program, fishermen were afforded the ability to harvest fish year-round as long as they had sufficient allocation to harvest fish. This resulted in increased flexibility for many fishermen to decide when and where to fish and how much to catch. The commercial red snapper sector is now open year-round and fishing occurs nearly every day of the year.

Share, allocation, and ex-vessel prices have all increased since the start of the RS-IFQ program. Inflation adjusted ex-vessel prices increased by 23% from 2006 to 2011, with much of the increase occurring in the 2007 fishing season. Average inflation-adjusted share prices nearly tripled during this same time period ($11 in 2007 vs. $28 in 2011), whereas average inflation adjusted allocation prices increased by 37% ($2.16 in 2007 vs. $2.96 in 2011). Average allocation prices in 2011 were approximately 12% of the price of an equivalent pound of shares, whereas allocation prices were 69% of the average ex-vessel price. Pre-RS-IFQ, there was an 11% increase in inflation-adjusted ex-vessel prices (2001-2006) compared to a 23% increase post-RS-IFQ. Appreciating prices suggest that fishermen have been successful at maximizing profits from commercial red snapper quota and also that they have increased confidence in RS-IFQ program.

Prices were highly volatile pre-RS-IFQ due to market gluts. Post-RS-IFQ implementation fishermen perceive prices and markets to be more stable, but price volatility post-RS-IFQ could not be properly analyzed due to underreporting and/or misreporting of prices by some fishermen and dealers to the RS-IFQ program. However, respondents to the Boen and Keithly (2012) survey did agree that there was less price volatility.

Annual fatalities per million vessel days in the Gulf decreased by 51% pre- and post-RS-IFQ. The industry as a whole is relatively indifferent in terms of the RS-IFQ program impact on safety at sea (Boen and Keithly 2012); however, medium and large shareholders as well as RS-IFQ participants in the northern and western Gulf perceived the RS-IFQ program to have improved safety at sea in the Gulf (Boen and Keithly 2012).

> Conclusion #3: The RS-IFQ program was successful at mitigating the race to fish providing fishermen with the opportunity to harvest and land red snapper year-round.

Inflation-adjusted share, allocation, and ex-vessel prices increased, indicating that fishermen were successfully maximizing profits and had increased confidence in the RS-IFQ program. Annual mortalities have declined since the RS-IFQ implementation. Medium and large shareholders perceived that the RS-IFQ program has improved safety at sea.

Biological Outcomes

The RS-IFQ program was intended to provide both direct and indirect biological benefits to red snapper by eliminating quota overages and reducing bycatch and discard mortality (GMFMC 2006). Biological benefits were expected to occur from improvements in fishing methods and processing practices, and slowing the race to fish. The RS-IFQ program was also expected to help address overfishing by decreasing fishing mortality associated with discards and bycatch because fishermen would have an incentive to minimize their costs (GMFMC 2006).

Data from the 2009 red snapper stock assessment indicate commercial fishing mortality rates declined after implementation of the RS-IFQ program and lower quotas. Stock abundance is increasing in response to revisions to the rebuilding plan implemented in 2007 allowing managers to increase quotas since 2010. No quota overruns have occurred since the RS-IFQ program was implemented. Overfishing was ended in 2009 as fishing mortality rates were reduced to sustainable levels (below $F_{26\%SPR}$) across the commercial, recreational, and shrimp sectors. Preliminary discard data from the 2013 stock assessment indicates discards are on average 60% less post-RS-IFQ (2007-2011) than pre-RS-IFQ (2002-2006). Current levels of discards are significantly lower in the western Gulf compared to pre-RS-IFQ levels, but comparable to pre-RS-IFQ levels in the eastern Gulf. Discard rates greatly vary by region with more than half of the red snapper caught along the Florida Peninsula being discarded by commercial fishermen.

Conclusion #4: The implementation of the RS-IFQ program coupled with revisions to the red snapper rebuilding plan and reductions in quota and the commercial size limit, have all contributed to lower commercial fishing mortality rates and reduced discards. The RS-IFQ system has also prevented commercial quota overruns, which were frequent prior to RS-IFQ implementation. Discards continue to be high in the eastern Gulf where a large percentage of legal-sized red snapper are discarded by fishermen due to a lack of allocation.

Social Impacts

The RS-IFQ program was designed to address f overcapacity and derby fishing conditions and improve the well-being of the industry through market stability, a longer fishing season, more flexibility for businesses, and improved safety at sea. Some of the expected adverse social impacts included: reduced employment opportunities for captains, crew, and businesses due to reductions in capacity, fairness and equity issues associated with initial allocations, additional costs to new fishermen gaining entry to the fishery, and quota consolidation by fishermen. Boen and Keithly (2012) indicated survey respondents had mixed feelings about the program, with large shareholders and shareholders in the western Gulf being more satisfied than small or

eastern Gulf shareholders. One positive effect of reducing overcapacity was that the average revenue per trip increased for both vertical line and longline vessels since implementation of the RS-IFQ program. However, there has been a reduction in crew size since implementation of the program. Large shareholders indicated that the RS-IFQ program had increased their ability to maintain skilled crew, whereas small shareholders expressed the opposite view (Boen and Keithly 2012).

Consolidation of shareholdings has occurred, with nearly a 25% reduction in accounts holding shares since the start of the program. While some consolidation may be expected in both the fleet and shares, over-consolidation is a concern. Since 2007, the number of shareholders holding large (>1.5%) and medium (0.1-1.5%) amounts of shares has remained similar, whereas the number of small shareholders has been greatly reduced.

The structure of the RS-IFQ program has allowed for the emergence of a new participation role of brokers, which buy and sell allocation but do not land red snapper. The number of individuals in this category has increased since the implementation of the program, resulting in an apparent shift in how people participate. Annually between 20-27% of all accounts only trade allocation and do not land allocation.

The Boen and Keithly (2012) survey also reported that the RS-IFQ program had a positive impact on the financial position of large and medium shareholders, whereas those with small shareholdings expressed the opposite opinion. Most shareholders agreed that the RS-IFQ program made it more difficult for others to enter the fishery. Share consolidation and an increase in the number of shareholders not landing any fish have led to the perceptions that many people are profiting simply by leasing allocation and not fishing. The costs to go fishing have also increased for some as shareholders are now charging captains and crew costs associated with the purchase of allocation.

> Conclusion #5: Large shareholders and western Gulf shareholders are generally more supportive of the RS-IFQ program than small to medium shareholders and those from the eastern Gulf. Entry and participation in the red snapper fishery is now more difficult and costly due to the increased costs of shares and allocation. Consolidation has resulted in less competition for harvest and higher revenues per trip. Crew sizes are smaller, but the ability to hire and keep stable crews has improved. The increase in the number of shareholders not landing any fish has led to perceptions that many are profiting from the program at the expense of hard-working fishermen.

Enforcement and Program Administration

Vessel monitoring systems, pre-landing notification requirements, and random dockside enforcement are used to ensure compliance with Gulf IFQ program regulations. Gulf IFQ regulations are jointly enforced by NOAA OLE, the Coast Guard and state enforcement agents, through joint enforcement agreements. Major violations since implementation of the RS-IFQ have included: false reporting of species harvested, under reporting of total weights landed, offloading between 6 p.m. and 6 a.m., insufficient allocation at the time of landing, landing prior to the three-hour minimum landing notice, landing at a location other than specified in the

landing notification, transporting an IFQ species without an approval code, completing a landing transaction without a landing notification, and offloading after approved hours. The number of federal RS-IFQ related cases has decreased since the start of the program from 20 to 10, although these cases do not include those being investigated by state agencies. Based on fisherman surveys in 2011, Porter et al. (2012) concluded compliance had improved under catch share management but increased enforcement efforts may be justified to ensure compliance benefits continue. IFQ program staff have made several enhancements to auditing of landing notifications and transactions in the past several years to aid enforcement and enhance compliance with reporting.

Boen and Keithly (2012) conducted a survey of RS-IFQ participants to gauge their level of satisfaction regarding the IFQ online system and customer service. In general, responses indicated satisfaction with regard to the IFQ online system, customer service when contacting NOAA Fisheries, and customer service while making landing notifications by phone. Despite indicating overall satisfaction with customer service, some respondents to the survey indicated the online computer system was difficult for some people to use, especially those that are not computer literate. NOAA Fisheries is continually making improvements to the online IFQ system to make the system more user friendly. IFQ customer service staff also frequently conduct dealer outreach, hold workshops, and disseminate Fishery Bulletins and other materials to aid fishermen and constituents using the IFQ system.

IFQ program expenses exceeded 3% of the value of the fishery during 2007-2011. Approximately $2.3 million dollars (4.8% of the program value) was spent on administering, enforcing, and monitoring the program.

> Conclusion #6: RS-IFQ participants are generally satisfied with the IFQ online system and customer service when contacting NOAA Fisheries and the 24-hour call service for 3-hour notifications. Vessel monitoring systems, notification requirements, and random dockside inspections aid enforcement in monitoring program compliance; however, a variety of enforcement violations has been identified. Compliance has improved since RS-IFQ program implementation but additional enforcement efforts may be necessary to deter violations. IFQ program expenses currently exceed the 3% cost recovery collected for program administrations, research, and enforcement.

6.1 Gulf Council Recommendations

The following is a summary of recommendations based on the Gulf Council's conclusions described in Section 5.0, input from the Gulf Council's advisory panels and SESSC, and discussions during Gulf Council meetings. It should be noted that some recommendations could potentially require a referendum of fishermen as specified in the Magnuson-Stevens Act.

Recommendation #1: Program Review

This was the Gulf Council's first attempt at reviewing an IFQ program and there was limited guidance on how to conduct such a review and what the review should entail. The review

occurred over the course of several years from 2011 through 2013 and involved numerous reports, studies, presentations, Gulf Council meetings, SESSC meetings, and advisory panel meetings. Future reviews should establish more formal procedures or guidelines for reviewing the RS-IFQ program, including but not limited to, timelines for review, procedures for receiving public input, the content of the review report, analyses required for the review, and the role of NOAA Fisheries Service, the Gulf Council, the SESSC, and Advisory Panels in commenting on and providing input on the review.

Additionally, as recommended by the Gulf Council's SESSC, it is recommended that future reviews of the RS-IFQ be aligned with reviews of the GT-IFQ program, because both are part of the multispecies reef fish fishery. The first review of the GT-IFQ program is scheduled for 2015. By aligning the two program reviews, objectives such as mitigating derby fishing conditions and reducing overcapacity can be analyzed in the context of a multispecies fishery.

Recommendation #2: Program Objectives

The current objectives for the RS-IFQ program were developed in Amendment 26 to the Reef Fish FMP. The objectives are generically worded and focus on reducing overcapacity and mitigating derby fishing conditions. This review concludes that progress in addressing these objectives has been made by the RS-IFQ program. It is recommended that existing objectives be reviewed and revised if necessary. When possible, more quantitative metrics for assessing program objectives should be established. Additionally, other goals and objectives may need to be added for subsequent reviews that have arisen from issues since RS-IFQ program implementation. For example, objectives pertaining to reducing bycatch in the eastern Gulf or maximizing harvest through redistribution of inactive shares could be considered. If any objectives of the program have been met, then they should also be eliminated and replaced with new objectives, as appropriate.

Recommendation #3: Inactive Accounts

As of 2011, there were over 100 inactive accounts that cumulatively held 1.5% of the red snapper quota. NOAA Fisheries Service IFQ program staff each year attempts to contact inactive account holders in an effort to increase utilization of shares and allocation. However, many shareholders are unable to be reached due to old contact information or because they have passed away. It is recommended that accounts remaining inactive for an extended period of time be redistributed to existing program participants, especially those with small or no amount of shares. Alternatively, inactive shares could be held by permit banks or the NOAA Fisheries Service for distribution as bycatch to small red snapper shareholders and allocation holders without shares based on procedures defined by the Gulf Council. NOAA Fisheries Service recently redistributed South Atlantic Wreckfish ITQ program shares. Approximately 1.4% of shares were considered inactive (no reported landings during 2006/07 - 2010/11 fishing years) and were distributed to active shareholders in 2013.

Recommendation #4: Discards and the Distributions of Shares

Gulf-wide commercial discards have declined since RS-IFQ program implementation and the reduction in the minimum size limit. Reductions in discards are greatest in the western Gulf and northern Gulf, but have remained largely unchanged in the eastern Gulf. Additionally, longlines and vertical lines operating in the eastern Gulf are discarding more than half their red snapper and most fish caught are legal-size, indicating fishermen do not have sufficient allocation to retain the discarded fish. It is recommended that management measures be implemented to help reduce bycatch in the eastern Gulf. Such measures could include redistribution of shares as quotas are increased to small shareholders and vessels fishing in the eastern Gulf. As discussed in Recommendation #3, a portion of the shares could be set aside for NOAA Fisheries Service to distribute to participants to reduce bycatch. Criteria for distribution of "bycatch" shares could be established by the Gulf Council through the amendment process.

Recommendation #5: Price Reporting

The results of this review were in part limited by poor price reporting of shares, allocation, and ex-vessel prices. The lack of reported prices or inaccurate price reporting results in the fishery being undervalued and can negatively affect commercial fishermen if used as the basis for commercial: recreational allocation decisions or disaster relief distributions. NOAA Fisheries Service implemented new regulations in 2011 defining ex-vessel value. This new definition, as well as outreach with dealers, has helped to improve ex-vessel price reporting, but some dealers still are deducting the costs of allocation and/or goods and services when reporting prices. As a result, the total value of the fishery is underestimated and trends in price data may not accurately reflect true market values. Additionally, many share and allocation prices go unreported or unreasonably low values are provided by fishermen. NOAA Fisheries Service has made several improvements to the IFQ online system (as recently as 2013) to better capture the complex nature of share and allocation transactions (e.g., barter/trade, related account, sale, etc.). However, additional outreach to fishermen is recommended and surveys, independent of business transactions, may be necessary to obtain and track true market values for share, allocation, and ex-vessel prices.

Recommendation #6: Public Participation

On January 1, 2012, any U.S. citizen or permanent resident alien was eligible to obtain an RS-IFQ account and purchase/sell RS-IFQ shares. During the first five years of the program, only reef fish permit holders were allowed to purchase/sell RS-IFQ shares. Since 2008, there has been an increasing trend in the number of RS-IFQ accounts only trading and not landing allocation. Given the abundance of red snapper and high price of allocation, many fishermen are frustrated that shareholders not landing any fish are profiting simply by leasing allocation. The Gulf Council's AHRS-AP recommended several options for mitigating potential impacts associated with public participation, including but not limited to caps on the amount of shares a non-permitted entity could obtain and use or lose provisions. Although the original RS-IFQ program designed by the Gulf Council authorized public participation, such a provision was not recommended by the Gulf Council's AHRS-AP during development of the program. Eligibility

for buying and selling shares should be revisited to determine if allowing non-permitted entities to do so is consistent with existing and any newly defined program goals and objectives.

7.0 Tables

Table 1. Summary of red snapper stock assessments.

Year	Overfished	Overfishing	Rebuilding target date	Model	Target
1988	Yes	Yes	2000	VPA	20% SSBR
1990	Yes	Yes	2007	VPA	20% SPR
1992	Yes	Yes	2009	VPA	20% SPR
1994	Yes	Yes	2009	VPA	20% SPR
1996	Yes	Yes	2019	VPA	20% SPR
1998	Yes	Yes	2019	VPA	20% SPR
1999	Yes	Yes	2032	ASAP	20% SPR
2005	Yes	Yes	2032	Catchem	$F_{OY} = 0.75F_{MSY}$ $MSST = (1\text{-}M)*B_{MSY}$
2009	Yes	Projected to end	2032	Catchem	$F_{OY} = 0.75F_{MSY}$ $MSST = (1\text{-}M)*B_{MSY}$

Table 2. Commercial red snapper management regulations (million lb gutted weight and inches TL)

Year	Days open	Quota	Harvest	Size Limit	Commercial Management Action	Amendment
1984	365	NA	NA	13		Reef Fish FMP
1990	365	2.79	2.40	13	Established commercial quota Bottom longlines prohibited within 50 fathoms west of Cape San Blas, FL and within 20 fathoms elsewhere	Amendment 1
1991	236	1.84	2.02	13	Reduced TAC by 20%	Regulatory Amendment
1992	95	1.84	2.81	13	Emergency rule: April 3- May 14 1,000 lb trip limit Moratorium on new reef fish permits 2,000 lb endorsement or 200 lb trip limit Closed fishery December 1	Emergency Rule Amendment 4
1993	94	2.76	3.08	13	Opened Feb 10 One trip limit per day Extended endorsements	Regulatory Amendment Amendment 6
1994	77	2.76	2.93	14	Raised minimum size over next 5 years Establish Class 1 and Class 2 licenses Extended reef fish permit moratorium	Regulatory Amendment Amendment 5 Amendment 9
1995	52	2.76	2.65	15	Opened Feb 28	Regulatory Amendment
1996	87	4.19	3.90	15	Increase TAC Split quota into spring and fall seasons Extended endorsement	Regulatory Amendment Amendment 13
1997	73	4.19	4.34	15	Fall season started Sept 2 for 1st 15 days/month till quota met	Regulatory Amendment
1998	72	4.19	4.22	15	Established permanent red snapper Class 1 and Class 2 license Allocated ⅔ quota to spring, starts Feb 1 Fall season started Sept 1, 1st 10 days /month	Regulatory Amendment Amendment 15
1999	70	4.19	4.40	15	Spring season reduced from 15 to 10 days/month	Interim rule
2000	66	4.19	4.36	15	Extended permit moratorium for 5 more years Spring season open on Feb 1 for 10 days each month till spring-quota reached (2/3 commercial quota) Fall season open Oct 1 for 10 days each month till remaining quota reached	Regulatory Amendment Amendment 17
2001	79	4.19	4.18	15		
2002	91	4.19	4.32	15		
2003	94	4.19	3.99	15		
2004	105	4.19	4.21	15		
2005	131	4.19	3.69	15	Extended reef fish permit moratorium indefinitely	Amendment 24
2006	126	4.19	4.21	15		
2007	365	2.99	2.87	13	Implemented commercial RS-IFQ program Reduced quota from 2006 level Mid-year quota increase Reduced size limit	Amendment 26
2008	366	2.30	2.24	13		
2009	365	2.30	2.24	13		
2010	365	3.19	3.06	13	Mid-year quota increase	
2011	365	3.30	3.24	13	Mid-year quota increase	

Table 3. RS-IFQ shareholder accounts by previous Class 1 and 2 license holders

	Class 1 only	Class 2 only	Class 1 and L[1]
Initial RS-IFQ accounts with shares	89	456	9
Percentage of accounts with shares	16%	82%	2%
Share holdings			
Small (<0.05%)	0	416	0
Medium (0.05 – 1.4999%)	79	40	6
Large (≥1.5%)	10	0	3
Changes in shares by end of year 2007			
Increased shares	14	23	3
Same shares	65	364	5
Decreased shares	10	69	1
Sold all shares	7	60	0

[1] The RS-IFQ account held both Class 1 and Class 2 licenses prior to the start of the program.

Table 4. RS-IFQ shareholder accounts selling all of their shares by shareholding size

	Small (<0.05%)	Medium (0.05 – 1.4999%)	Large (≥ 1.5%)	Total
2007	52	14	1	67
2008	27	6	0	33
2009	38	3	0	41
2010	33	9	0	42
2011	24	5	0	29

Table 5. RS-IFQ shareholder accounts acquiring shares for the first time

	Small (<0.05%)	Medium (0.05 – 1.4999%)	Large (≥ 1.5%)	Total
2007	8	2	0	10
2008	7	3	0	10
2009	5	1	0	6
2010	19	8	1	28
2011	14	8	0	22

The above accounts did not hold shares at the start of the year but did hold shares by the end of that year. These accounts may have owned shares in a previous year but subsequently sold all those shares prior to repurchasing shares.

Table 6. Share concentration and market power by lowest known entity (LKE)

Shareholdings	Number of LKE					
	Initial	**EOY 2007**	**EOY 2008**	**EOY 2009**	**EOY 2010**	**EOY 2011**
<0.005	241	221	216	219	213	200
0.005-0.009999	105	87	79	61	59	55
0.01-0.049999	167	151	139	132	121	113
0.05-0.99999	22	19	19	17	20	22
0.1-0.49999	57	55	56	57	57	65
0.5-0.9999	38	32	31	29	31	29
1-1.49999	13	10	10	11	11	12
1.5 or higher	15	18	18	17	16	16
Total LKE	**658**	**593**	**568**	**543**	**528**	**512**
Quota held by LKEs holding ≥ 1% shares	52%	58%	59%	62%	60%	61%
Gini Coefficient	0.866	0.872	0.872	0.874	0.870	0.864
Herfindahl-Hirschman Index	157.3	180.7	185.8	206.4	212.5	209.9

The lowest known entity is the individual human unless a business did not supply the corporate shareholdings. In those instances, the business becomes the lowest known entity.

Table 7. Concentration and market power by vessel landings

Year	Vessels	Gini	HHI
2002	491	0.799	106.4
2003	490	0.798	106.8
2004	497	0.802	111.1
2005	490	0.812	127.1
2006	456	0.810	125.2
2007	319	0.756	136.5
2008	308	0.767	159.1
2009	296	0.769	179.0
2010	376	0.767	175.0
2011	368	0.747	191.6

Source: SEFSC coastal logbook program, 2012

Table 8. Catch and effort characterization during open season

Source	Year	RS Landings (g.w. lbs)	Vessels	Trips	Days away	Avg. trip duration (days away/trip)	Avg. crew size (#/trip)	Avg. total landings (lbs/trip)
Logbook Database	1993	2,789,976	579	3,768	10,611	2.8	2.2	1,287
	1994	2,758,412	503	3,101	8,767	2.8	2.7	1,370
	1995	2,784,936	403	2,533	5,734	2.3	3.1	1,424
	1996	4,032,849	440	3,500	8,153	2.3	3.3	1,500
	1997	4,406,142	455	3,646	8,408	2.3	3.3	1,603
	1998	4,460,470	414	3,903	7,884	2.0	3.3	1,436
	1999	4,180,849	471	3,822	9,150	2.4	3.3	1,463
	2000	4,358,316	481	4,405	9,588	2.2	3.1	1,332
	2001	4,375,282	471	4,331	10,296	2.4	3.1	1,414
	2002	4,400,021	469	4,589	10,775	2.3	3.1	1,432
	2003	4,259,798	461	4,604	11,371	2.5	3.1	1,437
	2004	4,148,939	478	5,052	12,565	2.5	3.0	1,353
	2005	3,620,349	475	4,466	11,874	2.7	2.9	1,417
	2006	4,272,075	440	4,714	13,537	2.9	3.1	1,461
	2007	2,764,467	319	2,578	11,165	4.3	2.9	2,421
	2008	2,163,312	308	2,274	9,647	4.2	2.8	2,603
	2009	2,163,632	296	2,329	9,444	4.1	2.8	2,540
	2010	2,939,254	376	2,970	13,207	4.4	2.7	2,321
	2011	3,073,697	368	3,389	14,613	4.3	2.8	2,520
IFQ Database	2007	2,867,326	305	2,632	NA	NA	NA	NA
	2008	2,237,480	297	2,343	NA	NA	NA	NA
	2009	2,237,446	289	2,451	NA	NA	NA	NA
	2010	3,056,044	384	3,220	NA	NA	NA	NA
	2011	3,238,335	362	3,823	NA	NA	NA	NA

Source: SEFSC coastal logbook program, 2012

Table 9. Catch and effort characterization by fleet type during open season

Fleet	Year	Vessels	Trips	Days at sea	Crew days	Avg. days/Trip	Avg. crew/trip	Avg. red snapper landings (lbs/trip)	Avg. total landings (lbs/trip)
Vertical line	2002	403	4,382	9,436	28,945	2.2	3.1	940	1,324
	2003	400	4,384	9,974	30,578	2.3	3.0	912	1,323
	2004	418	4,714	10,953	32,982	2.3	2.9	777	1,215
	2005	409	4,163	10,217	30,240	2.5	2.9	794	1,273
	2006	374	4,404	11,785	35,087	2.7	3.0	902	1,348
	2007	283	2,435	9,926	30,664	4.1	2.9	1,061	2,310
	2008	273	2,104	8,349	25,200	4.0	2.8	990	2,458
	2009	266	2,217	8,526	25,593	3.8	2.8	949	2,426
	2010	322	2,639	10,308	28,344	3.9	2.7	1,067	2,145
	2011	314	3,064	12,032	33,234	3.9	2.7	965	2,227
Longline	2002	53	187	1,224	4,146	6.5	3.4	848	3,808
	2003	53	206	1,352	4,696	6.6	3.9	942	3,920
	2004	57	330	1,603	5,845	4.9	4.2	1,212	3,258
	2005	59	289	1,608	5,502	5.6	3.8	888	3,366
	2006	56	281	1,695	5,782	6.0	3.8	876	3,182
	2007	33	127	1,193	4,518	9.4	3.8	1,393	4,672
	2008	29	131	1,217	4,443	9.3	3.7	597	5,368
	2009	24	78	791	3,192	10.1	4.1	734	6,211
	2010	36	195	2,056	6,767	10.5	3.3	518	5,232
	2011	42	224	2,352	7,672	10.5	3.2	445	7,220

Source: SEFSC coastal logbook program, 2012

Table 10. Ratio of red snapper to total catch by trip by gears

Gear	Ratio (RS/TLBS)	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
VL	0-25%	14.5	14.5	16.7	19.7	17.6	35.3	41.5	42.0	37.7	43.5
	25-50%	8.8	9.9	10.7	10.3	11.4	22.0	21.1	19.4	22.0	20.9
	50-75%	15.2	16.5	17.7	14.3	12.4	13.3	11.0	11.3	13.0	10.5
	75-100%	61.5	59.2	54.9	55.7	58.7	29.4	26.4	27.3	27.2	25.1
LL	0-25%	58.4	58.3	43.8	57.6	56.8	68.5	90.1	89.7	93.3	98.1
	25-50%	1.9	9.9	4.3	4.3	5.3	13.4	8.4	7.7	4.1	1.4
	50-75%	3.8	5.0	5.9	6.8	5.6	6.3	1.5	1.3	2.1	0.5
	75-100%	35.9	26.9	46.0	31.3	32.3	11.8	0	1.3	0.5	0

VL – vessels using vertical line gear; LL – vessels using bottom longline gear
Source: SEFSC coastal logbook program, 2012

Table 11. Allocation activity in pounds

	2007	2008	2009	2010	2011
Allocation transferred	1,686,218	1,371,100	1,539,479	3,065,736	3,639,394
% of Quota	56%	60%	67%	96%	110%
Remaining Allocation[1]	122,318	59,567	61,377	133,105	65,408
% of Quota	4.1%	2.6%	2.7%	4.2%	2.0%
Inactive Accounts[2]	78,543	50,338	41,680	53,151	50,743
% Year End Quota	2.6%	2.2%	1.8%	1.7%	1.5%
Only trading allocation	556,706	474,665	627,807	1,497,168	1,760,875
% allocation transfers	33%	35%	41%	49%	48%
Sold all allocation[3]	503,735	455,043	624,268	1,276,215	1,471,000
% allocation transfers	30%	33%	41%	42%	40%

[1] Remaining allocation is the actual positive allocation remaining in the accounts at the end of the year. This will differ from the value generated by subtracting landings from quota due to other accounts that had 10% overages and take-back allocation in the following year.

[2] Inactive IFQ Accounts are accounts that possessed shares but did not land, buy, or sell allocation; this includes both accounts that have and have not been logged into in that year.

[3] Sold, in this instance, means transferred out all allocation, but necessarily for monetary gain.

Table 12. Allocation activity in accounts

	2007	**2008**	**2009**	**2010**	**2011**
Accounts with allocation[1]	596	547	530	598	589
Received through shares[2]	554 (93%)	497 (91%)	474 (89%)	461 (77%)	439 (75%)
Received through purchase	42 (7%)	50 (9%)	56 (11%)	137 (23%)	150 (25%)
With permits	508 (85%)	412 (75%)	383 (72%)	461 (77%)	458 (78%)
Accounts with remaining allocation	327 (55%)	292 (53%)	242 (46%)	306 (51%)	236 (40%)
Inactive Accounts[3]	173 (29%)	168 (31%)	137 (26%)	122 (20%)	102 (17%)
Accounts only trading allocation	144 (24%)	110 (20%)	131 (25%)	139 (23%)	159 (27%)
With shares and permits	117	63	75	75	93
With shares, no permits	21	36	49	48	46
Without shares, with permits	6	11	7	16	20
Sold all allocation[4]	131 (22%)	101 (18%)	123 (23%)	110 (18%)	142 (24%)
Accounts that landed fish	279 (47%)	269 (49%)	262 (49%)	337 (56%)	328 (56%)
Landed fish and held shares	243 (41%)	230 (42%)	213 (40%)	216 (36%)	198 (34%)
Only landed fish	99 (17%)	94 (17%)	74 (14%)	43 (7%)	30 (5%)

[1] All percentages are based on the total accounts with allocation.

[2] This is the total number of RS-IFQ accounts that received allocation through share holdings either at the start of the year or from the mid-year increases and not a year-end count.

[3] Inactive IFQ Accounts are accounts that possessed shares but did not land, buy, or sell allocation; this includes both accounts that have and have not been logged into in that year.

[4] Sold, in this instance, means transferred out all allocation, but necessarily for monetary gain.

Table 13. Ex-vessel transfer price analysis

	2007	2008	2009	2010	2011
Total number of transactions	2667	2388	2492	3251	3870
With prices[1]	2455	2023	1963	2319	2985
Percentage with prices	92%	85%	79%	71%	77%
Average $/ lb[2]	$3.74	$4.06	$4.13	$4.17	$4.26
Inflation adjusted average $/ lb[3]	$3.99	$4.24	$4.27	$4.26	$4.26

[1] For this review, the analysis of the ex-vessel prices resulted in the exclusion of any ex-vessel price less than $2.60/lb or greater than or equal to$10.00/lb. Values are different than the 2011 Red Snapper Annual Report only excluded prices greater than or equal to $10.00, as these values were considered typographical errors by the dealers.
[2] Averages were completed on a per pound basis and not on a transactional basis.
[3] Values were adjusted for inflation using the GDP deflator, with 2011 as the base year.

Table 14. Share transfer price analysis

	2007	2008	2009	2010	2011
Total number of transactions	108	42	75	79	78
Limited by Review criteria[1]	21	22	38	33	26
Percentage with prices	19%	52%	51%	42%	33%
Average $/equivalent lb[2]	$11.04	$11.56	$20.64	$19.58	$28.87
Inflation adjusted average $/equivalent lb[3]	$11.78	$12.07	$21.36	$20.00	$28.87

[1] For this review, the analysis of the share prices resulted in the exclusion of any price per equivalent pound that was less than $9.00/lb and ≥ $36/lb. Values are different than the 2011 Red Snapper Annual Report which excluded share prices where the price per equivalent pound were ≤ $0.01/lb and ≥ $36/ lb.
[2] Averages were completed on a per equivalent pound basis and not on a transactional basis. The 2011 Annual Report used averages based on transactions, not equivalent pounds.
[3] Values were adjusted for inflation using the GDP deflator, with 2011 as the base year.

Table 15. Allocation transfer price analysis

	2007	2008	2009	2010	2011
Total number of transactions	808	683	843	1719	2155
Limited by review criteria[1]	171	168	294	350	477
Percentage with prices	21%	25%	35%	20%	22%
Average $/ lb[2]	$2.02	$2.30	$2.69	$2.85	$2.96
Inflation adjusted average $/ lb[3]	$2.16	$2.40	$2.79	$2.91	$2.96

[1] Any allocation price per pound greater than $5.00/lb was assumed to be a total price and divided by the pounds purchased to calculate a price per pound. For this review, the analysis of the allocation prices resulted in the exclusion of any price per pound that was less than $2.60 and greater than $5.50/lb. Values are different than the 2011 Red Snapper Annual Report which excluded allocation prices less than or equal to $0.01 and greater than $5.50/lb.
[2] Averages were completed on a per pound basis and not on a transactional basis.
[3] Values were adjusted for inflation using the GDP deflator, with 2011 as the base year.

Table 16. Inflation-adjusted allocation ratios

	2007	2008	2009	2010	2011
Average allocation price ($/lb)	$2.16	$2.40	$2.79	$2.91	$2.96
Ratio of allocation traded to quota	56%	60%	67%	96%	110%
Average ex-vessel price ($/lb)	$3.74	$4.06	$4.13	$4.17	$4.26
Ratio of allocation to ex-vessel price	58%	59%	68%	70%	69%
Average share price ($/ equiv. lb)	$11.78	$12.07	$21.36	$20.00	$28.87
Ratio of allocation to share price (in equiv. lb)	18%	20%	13%	15%	10%

Table 17. Red snapper discards (number of fish) by region and gear.

	Vertical Lines		Longlines	
Year	East	West	East	West
1990	160,529	514,832	9,785	830
1991	393,151	883,567	20,755	2,654
1992	376,479	431,919	19,061	635
1993	274,158	394,114	46,508	1,303
1994	392,290	366,083	56,541	1,859
1995	376,595	364,392	37,049	2,774
1996	544,246	834,747	36,827	2,230
1997	427,869	745,528	51,023	1,333
1998	464,584	861,635	50,787	1,459
1999	555,538	800,884	50,831	4,149
2000	387,975	732,267	31,265	3,006
2001	366,180	813,788	29,282	1,857
2002	322,472	893,829	11,240	2,684
2003	630,101	720,669	7,692	5,255
2004	272,179	659,515	31,193	7,413
2005	262,582	880,279	20,080	6,554
2006	200,469	451,676	9,338	5,666
2007	249,901	105,229	100,630	10,196
2008	321,773	94,040	97,939	9,924
2009	491,041	11,047	52,734	5,343
2010	249,282	7,228	28,869	2,925
2011	251,164	13,713	41,200	4,175

Source: SEFSC reef fish observer program, April 16, 2012.

Table 18. Red snapper bycatch discard ratio and discard mortality

	07/01/06 – 05/01/07	05/02/07 - 12/31/07	2008	2009	2010	2011
Landing to Discard Ratio						
By Region						
FL peninsula	0.93	0.73	0.51	0.12	0.81	0.71
FL Panhandle – MS	1.37	6.41	4.71	0.7	7.02	5.4
LA- TX	0.76	2.75	4.56	15.57	4.21	3.75
By Gear						
Vertical lines	1.04	3.48	3.46	1.32	2.56	3.54
Longlines	0.33	0.07	1.4	0.53	1	0.49
Observed discard mortality (%)						
By Region						
FL peninsula	15	15	21	5	17	13
FL Panhandle – MS	13	35	35	92	28	22
LA- TX	33	63	55	28	74	47
By Gear						
Vertical lines	22	39	43	17	29	28
Longlines	26	28	44	24	21	14

Source: SEFSC reef fish observer program, April 16, 2012.

Table 19. RS-IFQ related seizures

	2007	2008	2009	2010	2011
IFQ cases	20	17	20	9	10
IFQ Red Snapper seizures	7	6	2	4	6
Pounds red snapper	7,678	1,622	250	538	6,683
Seizure Value	$33,270	$6,525	$910	$2,170	$26,619

Table 20. Quarterly cost recovery fees

Quarter	2007	2008	2009	2010	2011
Jan – Mar	$76,997	$91,897	$72,386	$93,262	$94,357
Apr – Jun	$77,310	$59,785	$66,176	$79,566	$84,836
Jul – Sept	$66,248	$42,818	$50,794	$46,729	$78,382
Oct – Dec	$83,261	$53,315	$50,801	$88,718	$89,302
Total	$303,816	$247,815	$240,157	$308,285	$346,877

Table 21. Outreach activities

Quarter	2006	2007	2008	2009	2010	2011	2012
Dealer visits	NA	NA	NA	NA	6	6	16
Public meetings	8	1	NA	13	NA	NA	4
Fishery Bulletins	7	5	6	4	6	6	4

Table 22. Reported vs. actual (imputed) ex-vessel revenue

	2007	2008	2009	2010	2011
Reported ex-vessel revenue	$10,129,443	$8,260,460	$8,005,360	$10,275,833	$11,544,927
Actual ex-vessel revenue	$10,728,523	$9,050,449	$9,049,900	$12,425,662	$13,500,191

8.0 Figures

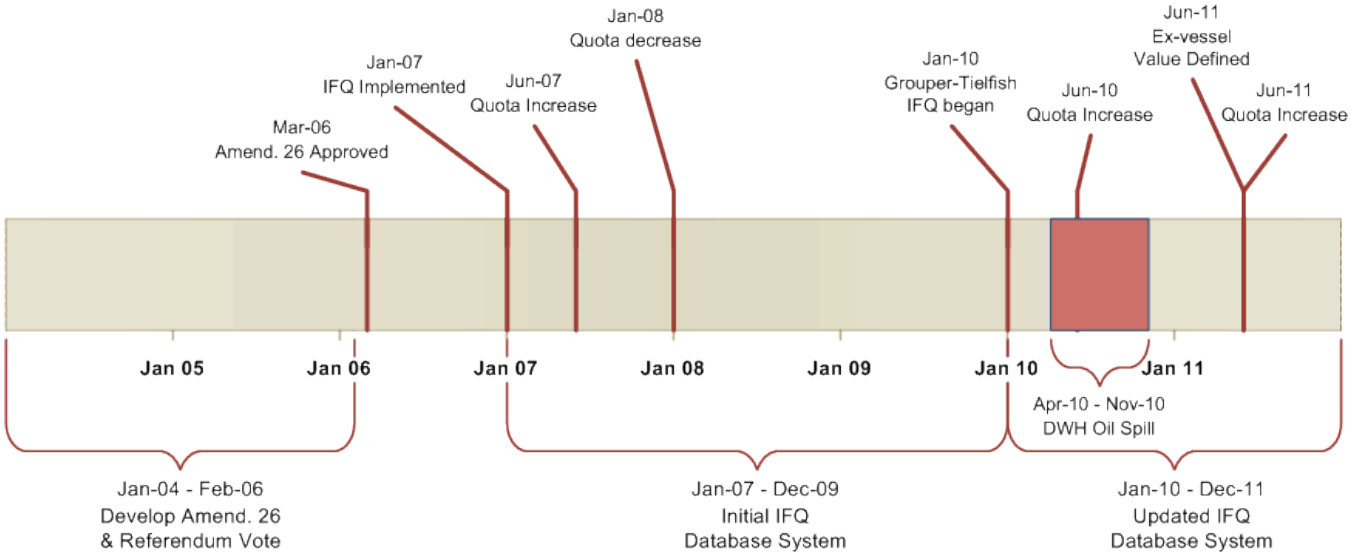

Figure 1. Red snapper IFQ timeline

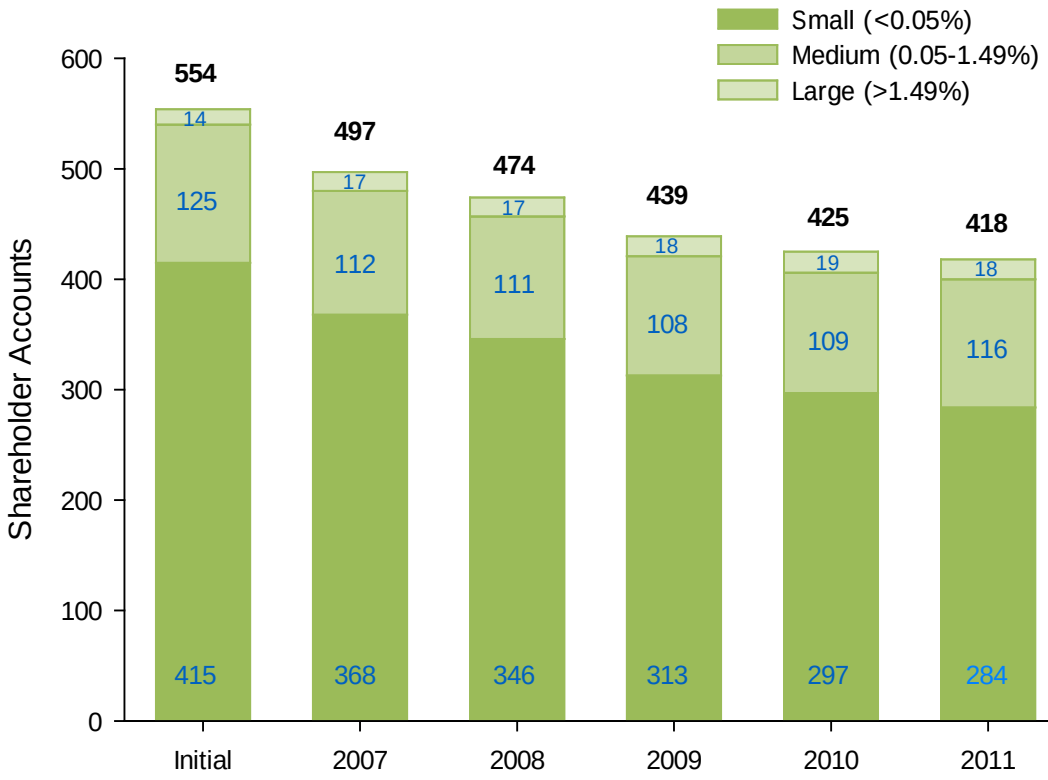

Figure 2. Accounts holding shares, 2007-2011.

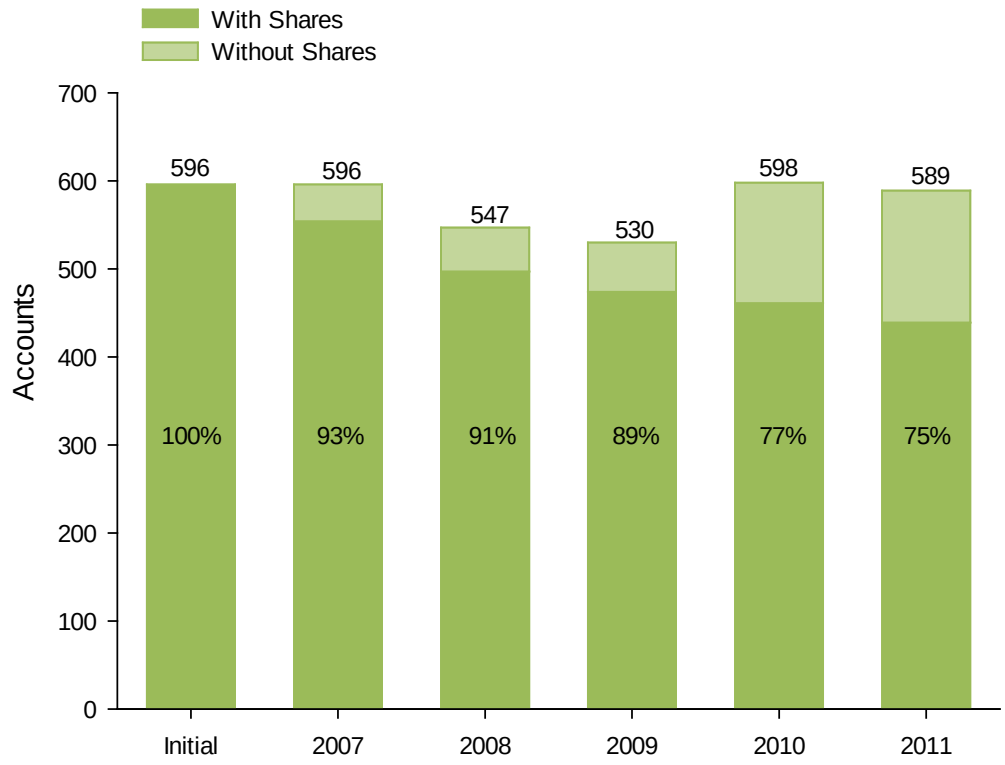

Figure 3. Accounts holding allocation

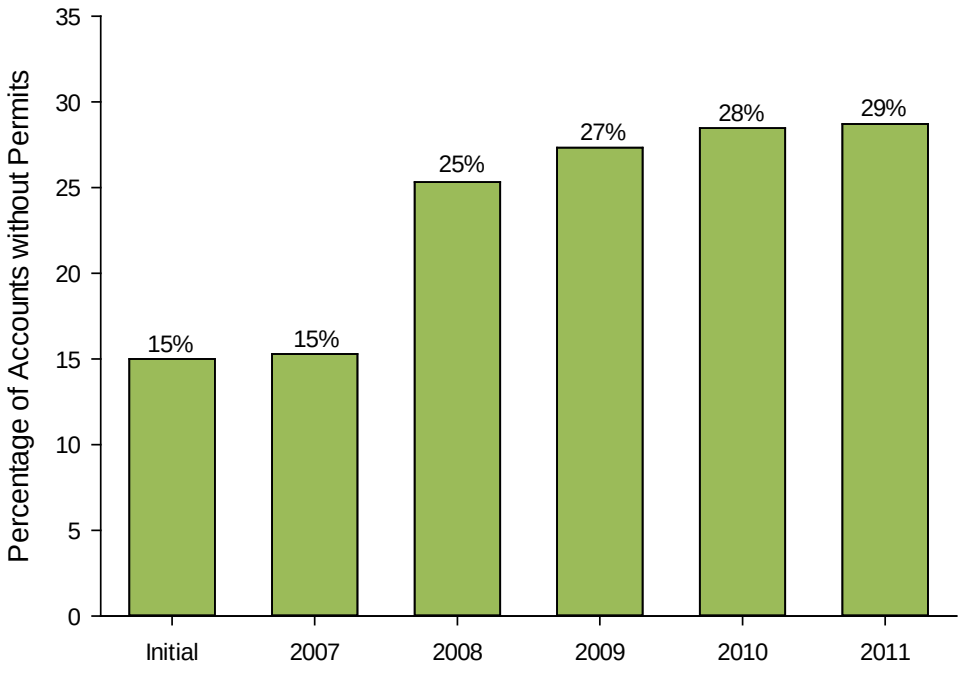

Figure 4. Accounts with shares but without a Gulf reef fish permit

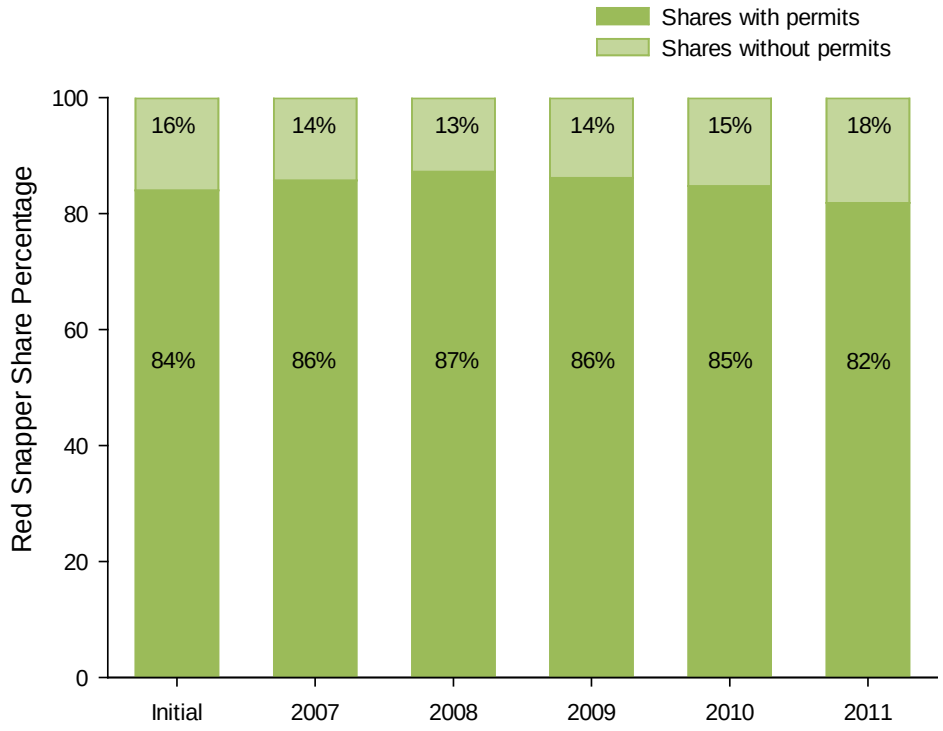

Figure 5. Shares held by permit status

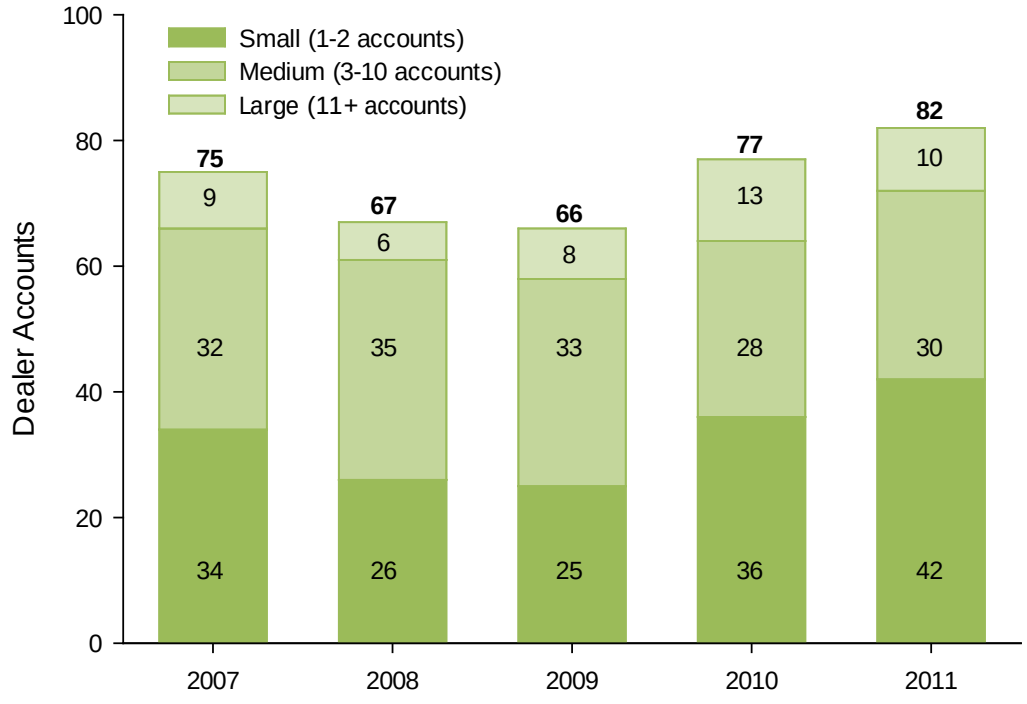

Figure 6. Dealers participating in the RS-IFQ program

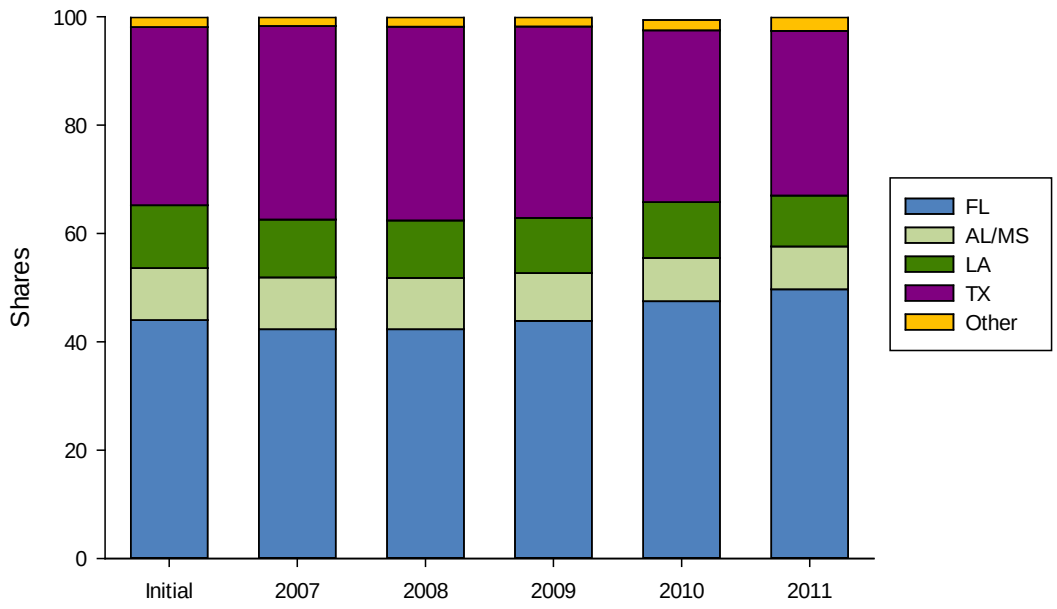

Figure 7. Shareholdings by state of residency

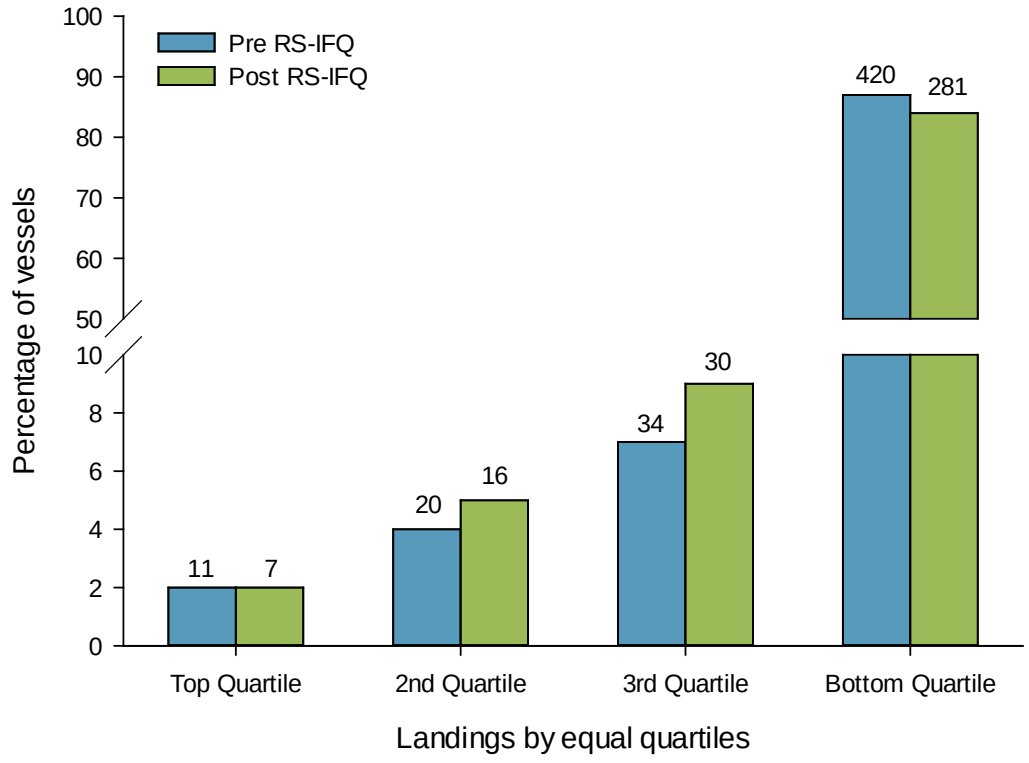

Figure 8. Percentage of vessels by landing quartiles pre- and post-RS-IFQ.

N represents the number of vessels per quartile. Source: SEFSC coastal logbook program, 2012.

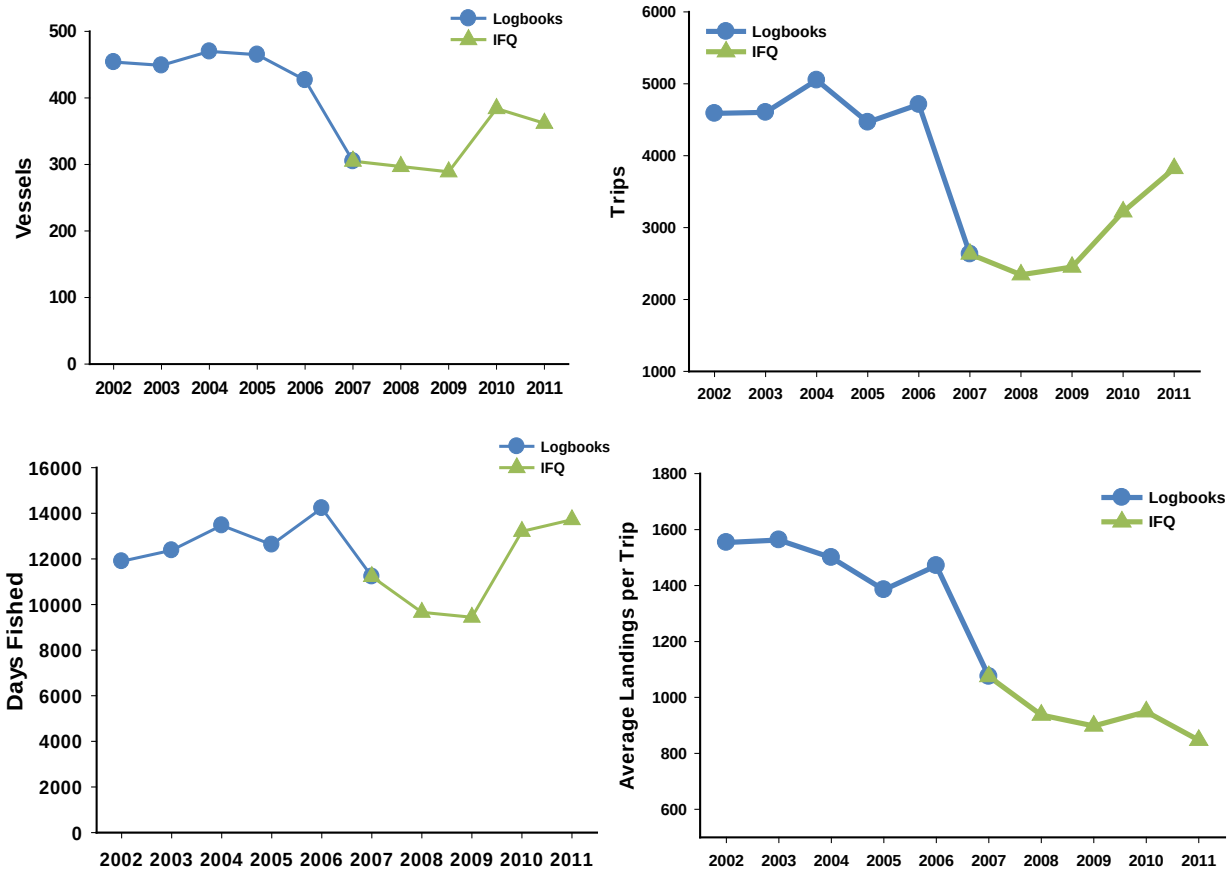

Figure 9. Vessels, trips, days fished, and nominal landings per trip pre- and post-RS-IFQ.

Source: SEFSC coastal logbook program, 2012.

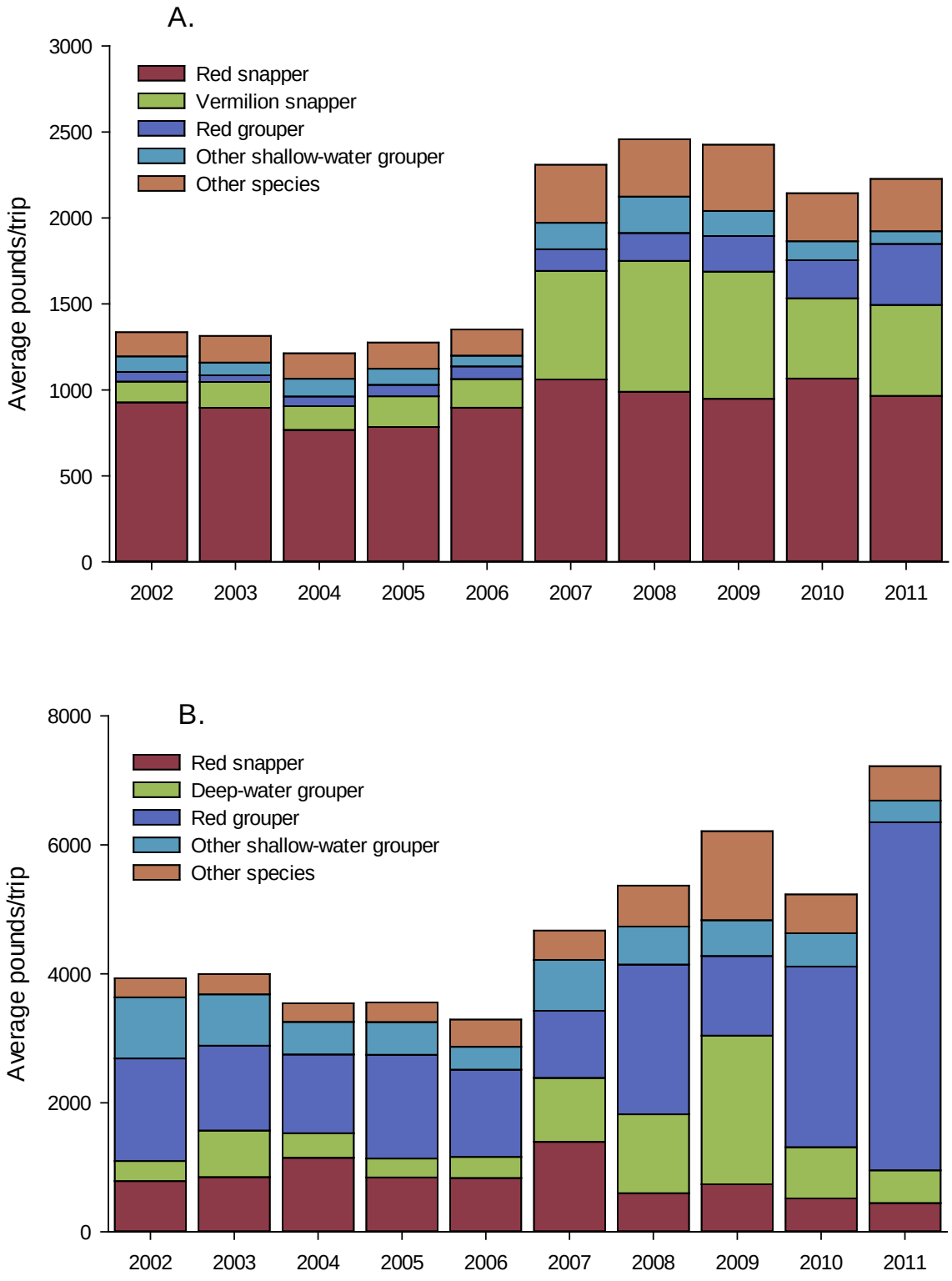

Figure 10. Average catch composition in pounds per trip

(A) Vertical line and (B) and longline gears. Source: SEFSC coastal logbook program, 2012.

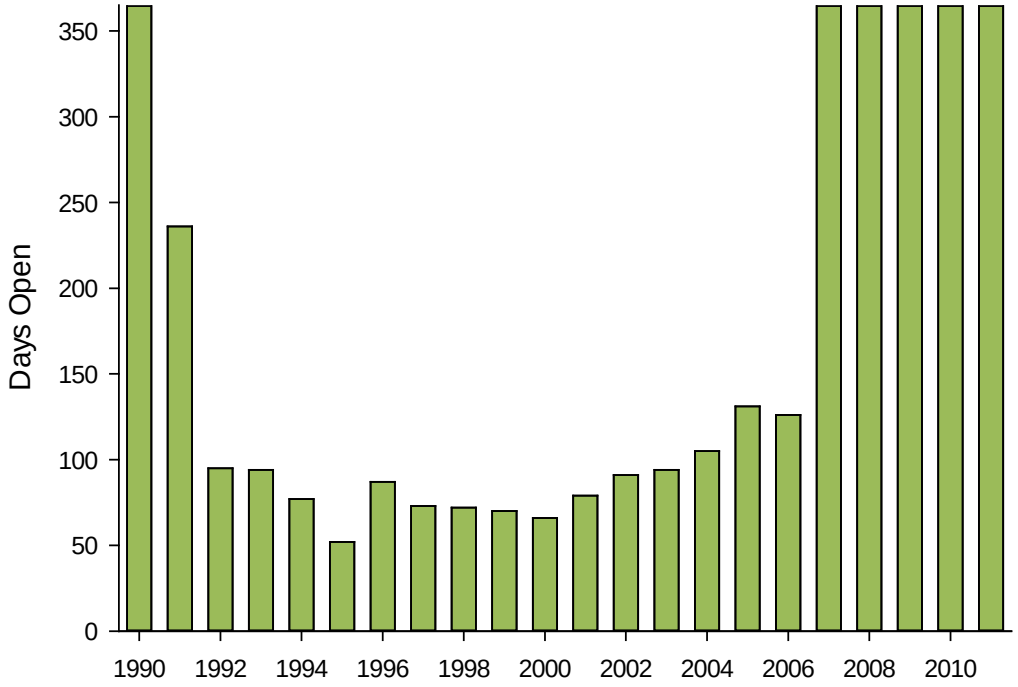

Figure 11. Commercial red snapper season length, 1990-2011

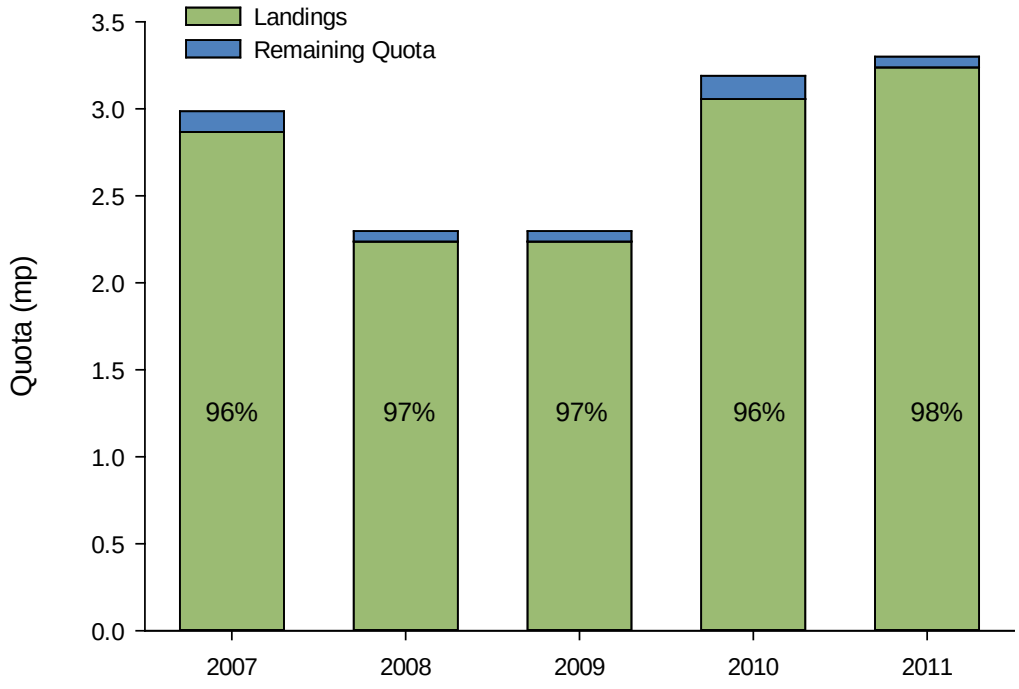

Figure 12. Commercial red snapper quota harvested per year

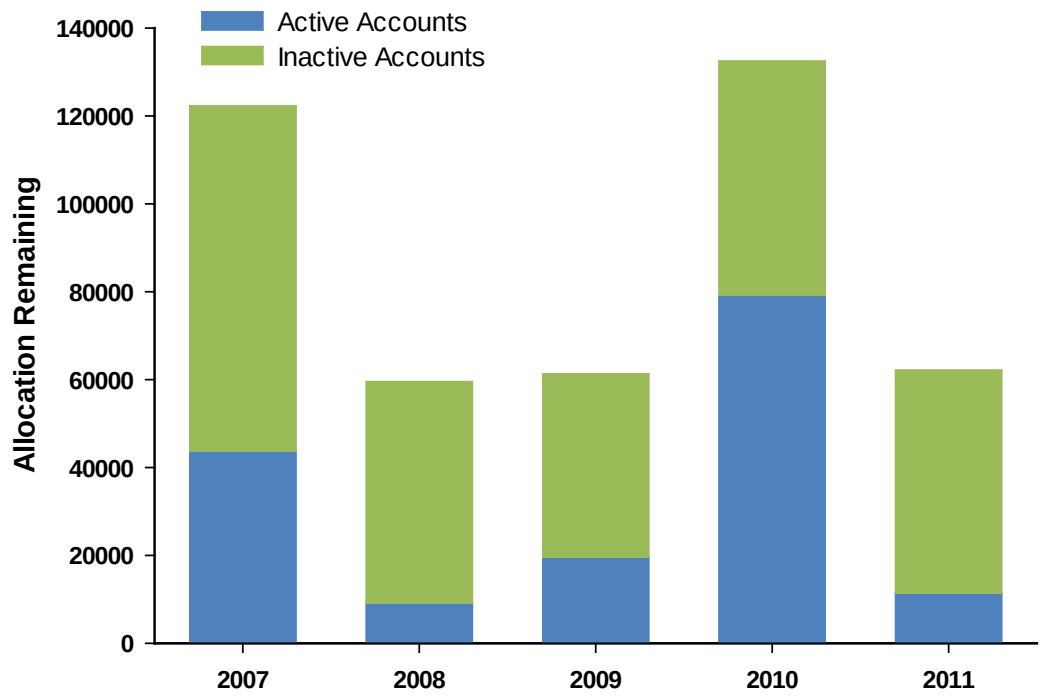

Figure 13. Remaining allocation by account activity

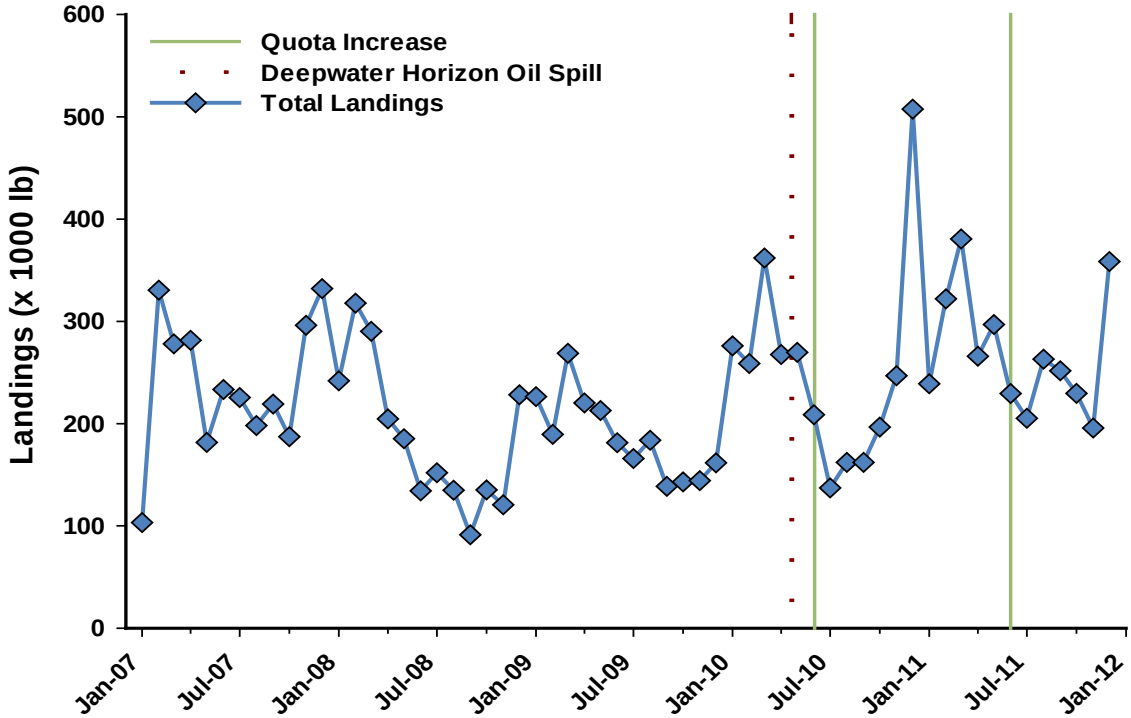

Figure 14. Monthly landings since the start of the RS-IFQ program

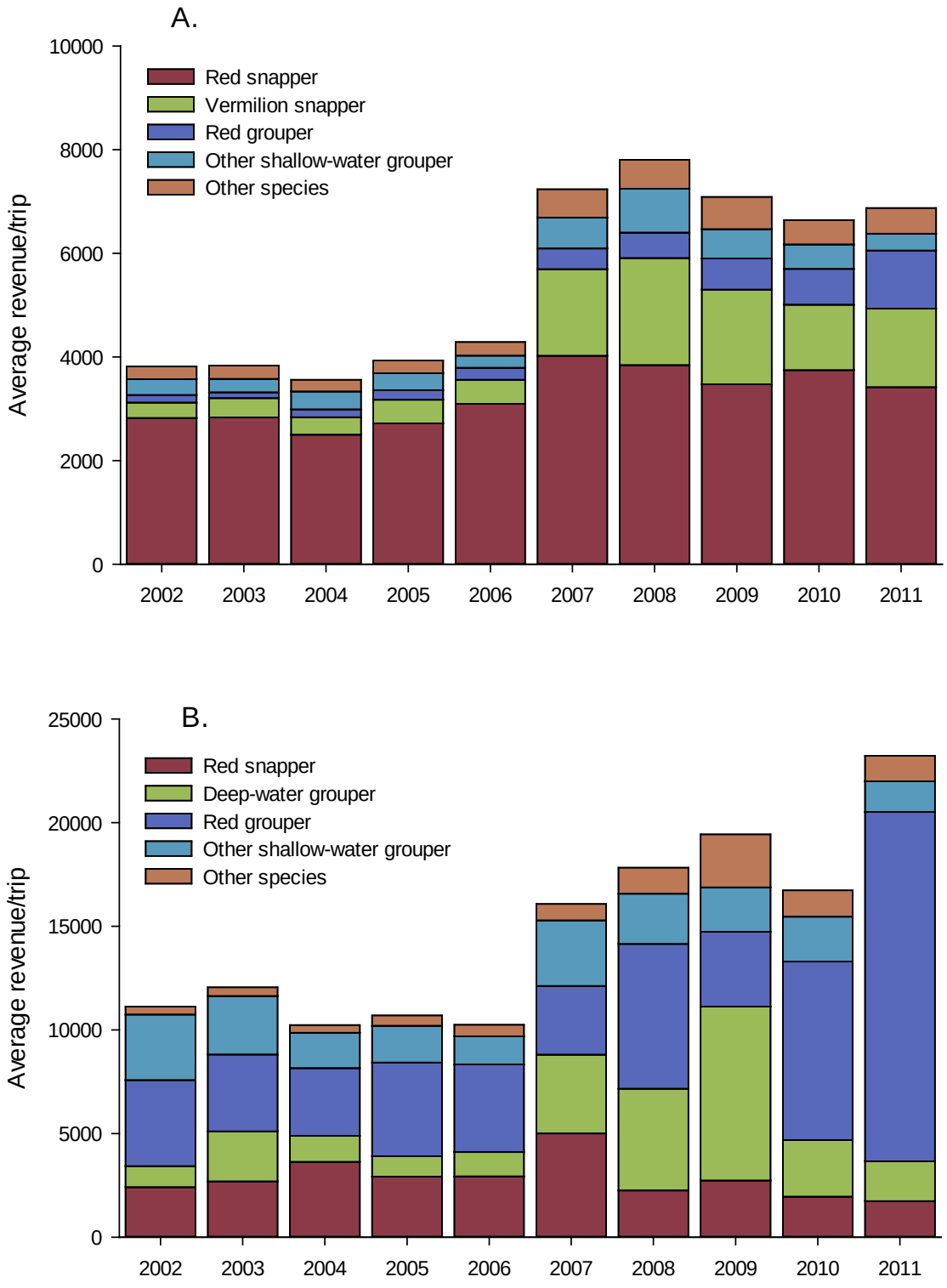

Figure 15. Average revenue per trip

(A) vertical line and (B) longline gears. Revenue values have been adjusted for inflation using the GDP deflator with 2011 as the base year. Source: SEFSC coastal logbook program, 2012.

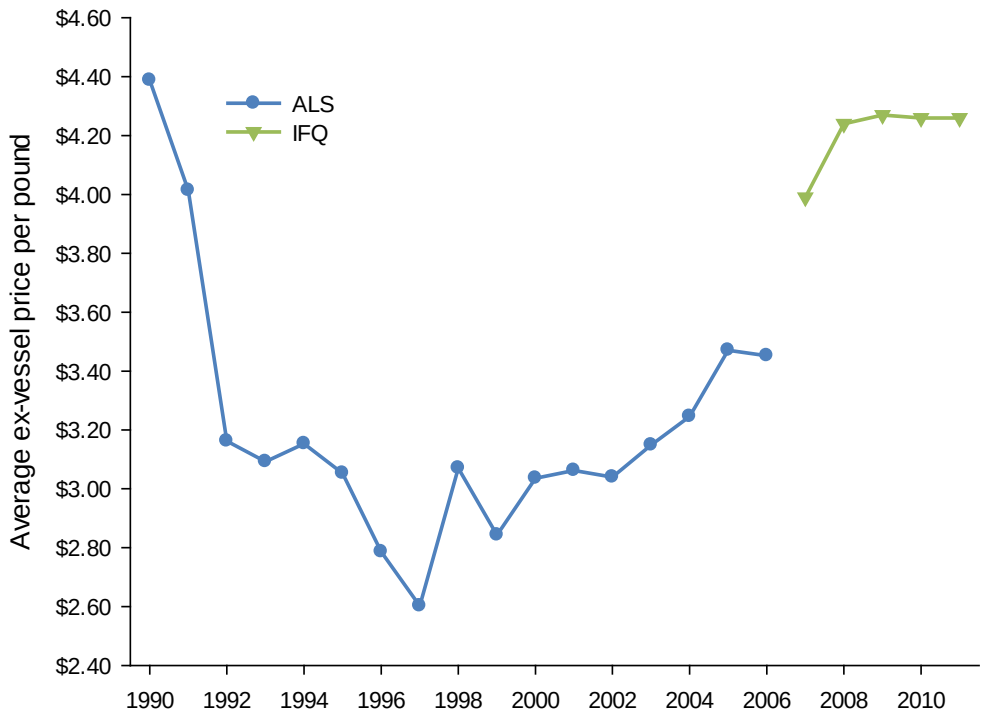

Figure 16. Annual average inflation-adjusted ex-vessel prices over time using.

Source: SEFSC accumulated landings system (2012) and the RS-IFQ database (2012)

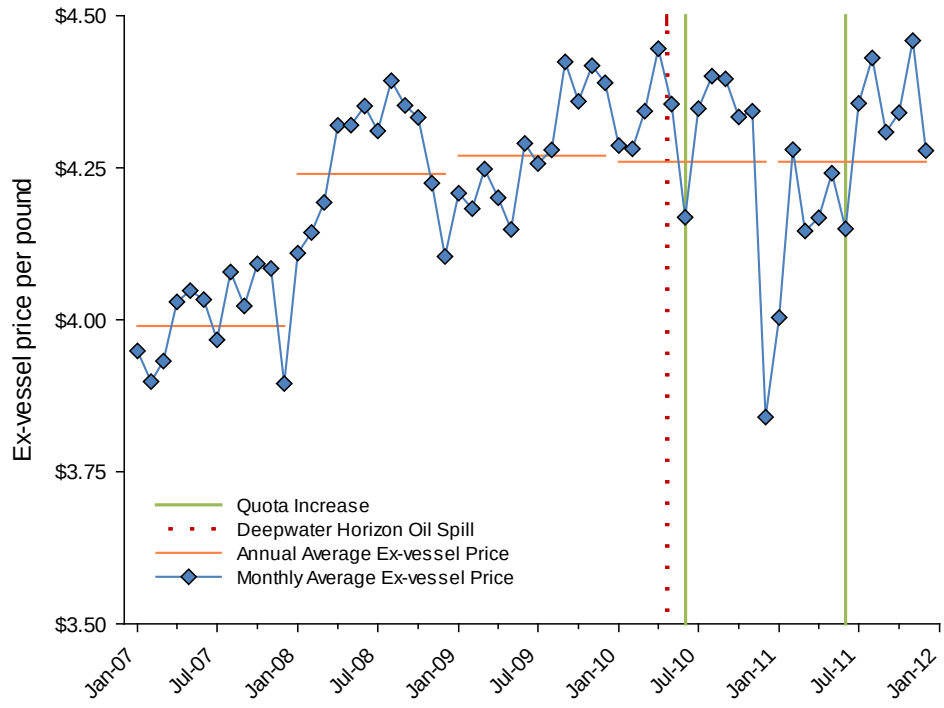

Figure 17. Monthly average inflation-adjusted ex-vessel prices during RS-IFQ years

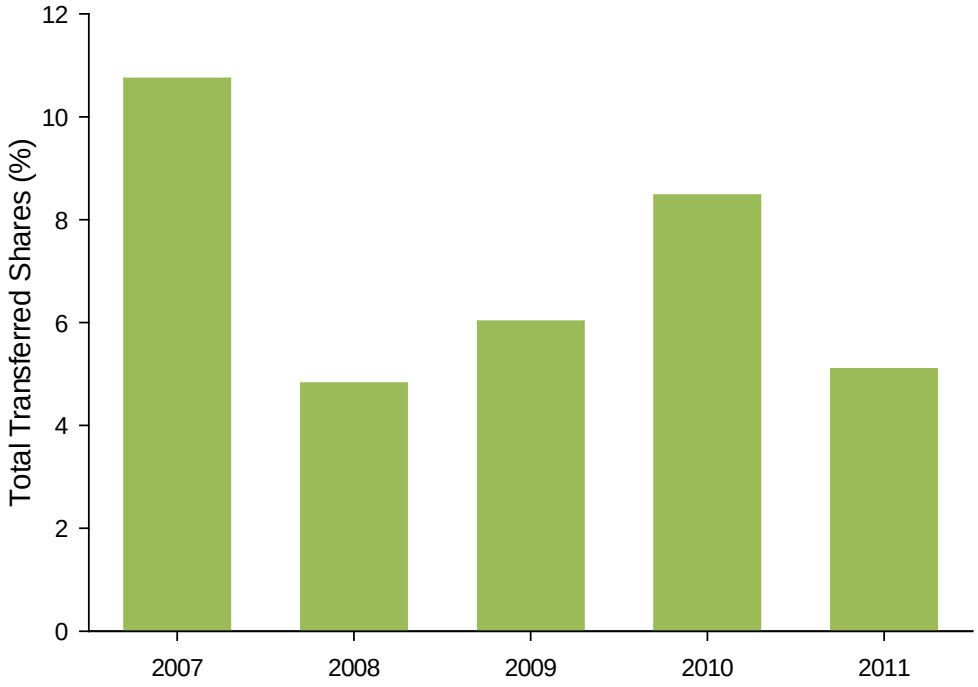

Figure 18. Share transfers over time

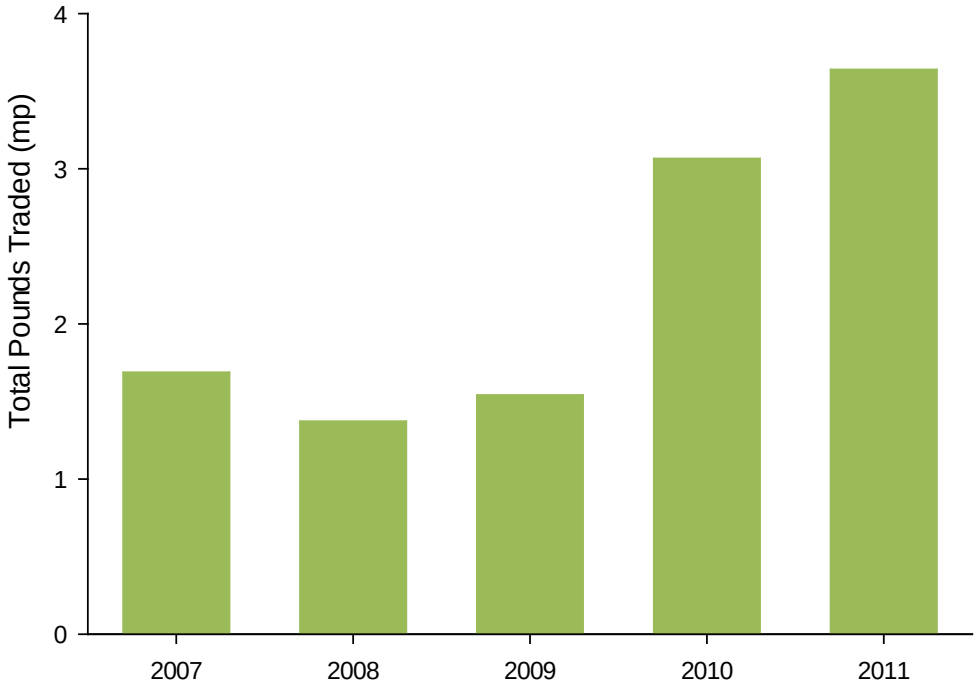

Figure 19. Allocation transfers over time

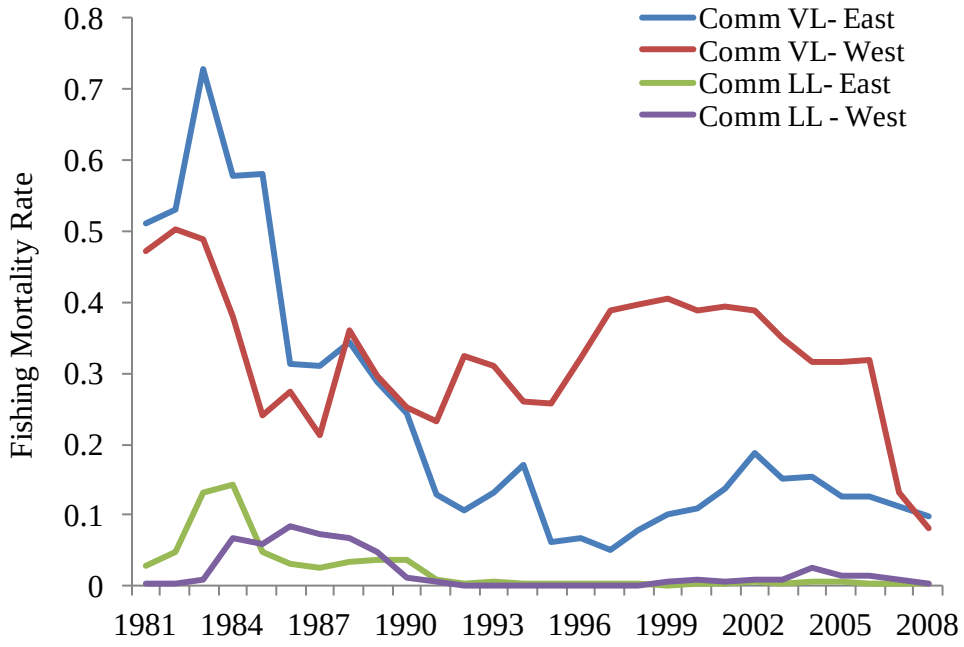

Figure 20. Fishing mortality rates by commercial gear type and region, 1981-2008

Source: SEDAR 7 Update (2009).

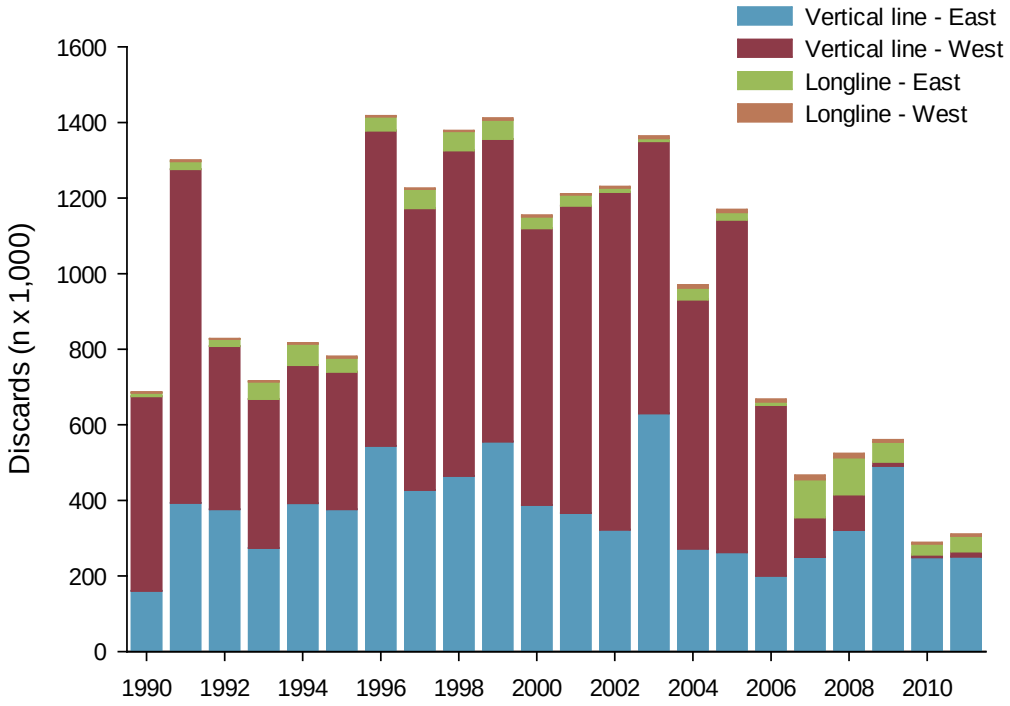

Figure 21. Estimates of red snapper commercial discards by year, gear type, and area fished

Source: SEDAR 33 (2013)

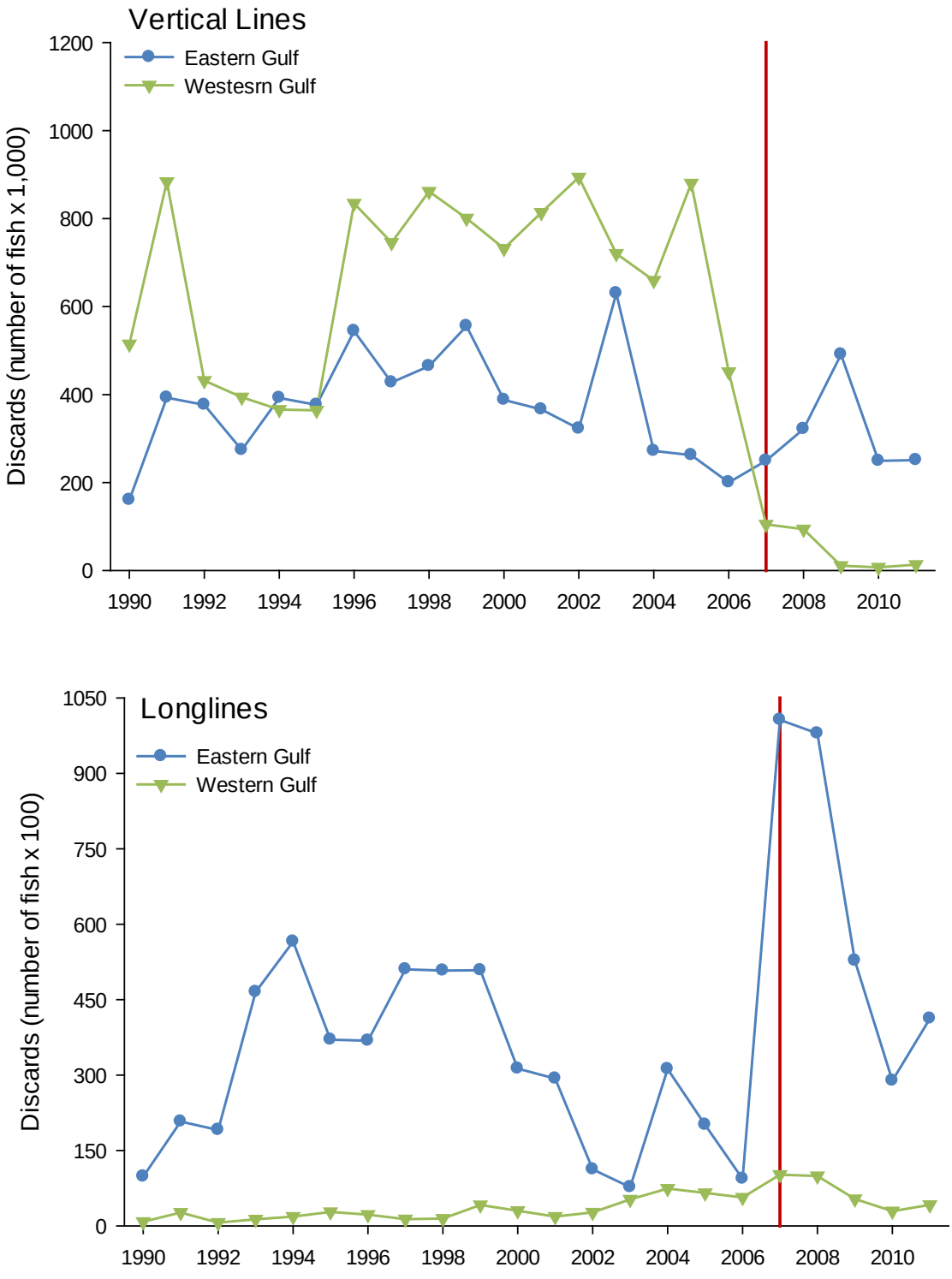

Figure 22. Red snapper commercial discards by gear in the eastern and western Gulf.

Source: SEDAR 33 (2013)

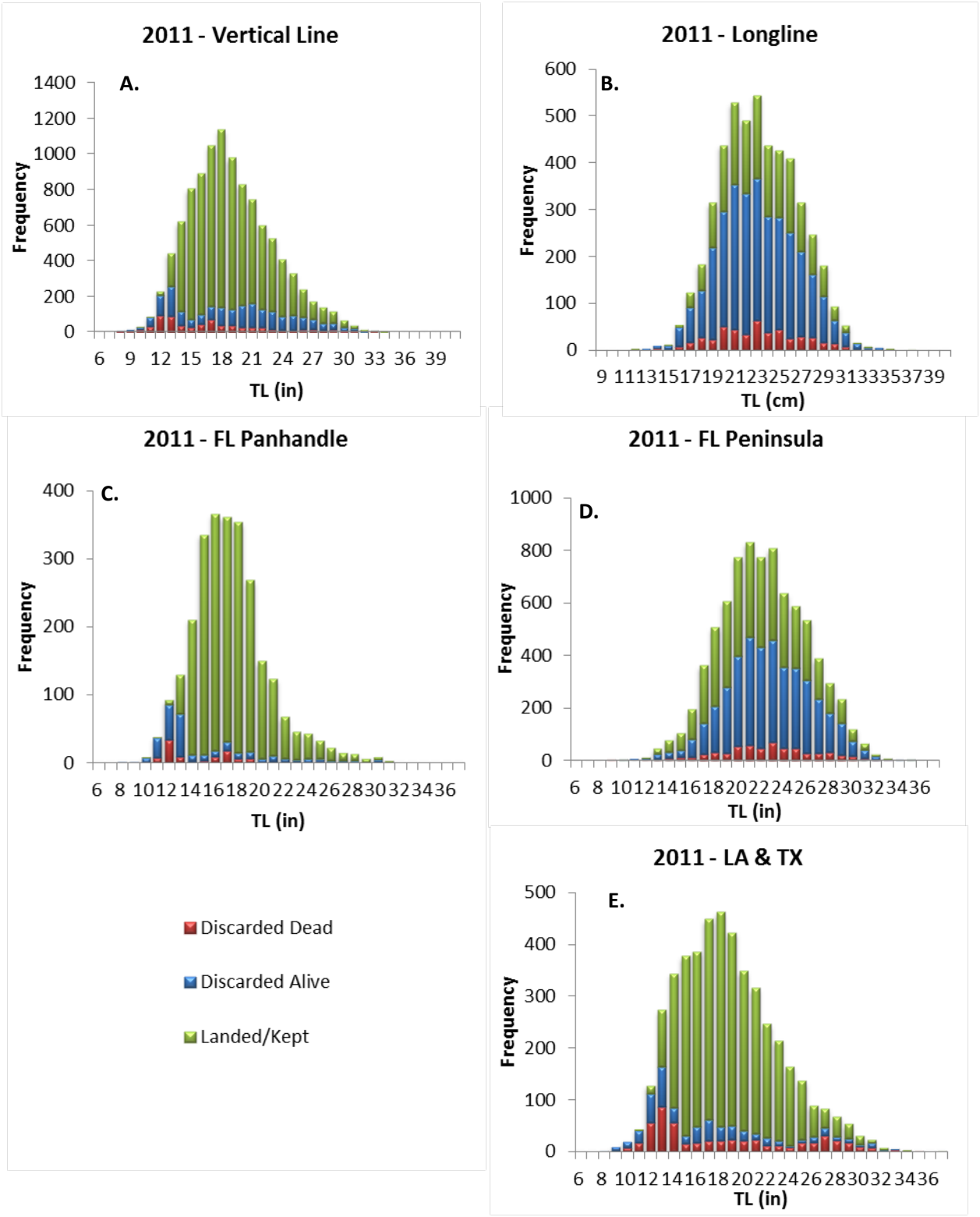

Figure 23. 2011 size frequency distributions by disposition status of red snapper.

Green: Landed/kept; red: discarded dead; and blue: discarded alive. (A) Vertical lines, (B) Longlines, (C) Florida panhandle, (D) Florida peninsula, and (E) LA & TX. Source: SEFSC reef fish observer program (2012).

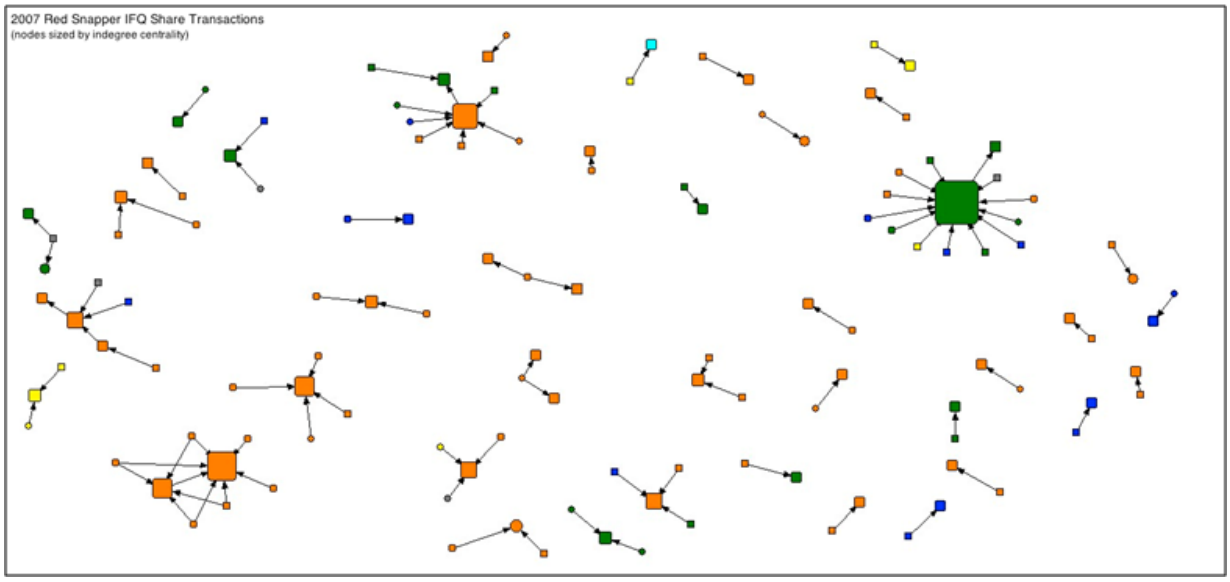

Figure 24. Red snapper share transactions by degree centrality for the 2007 fishing year

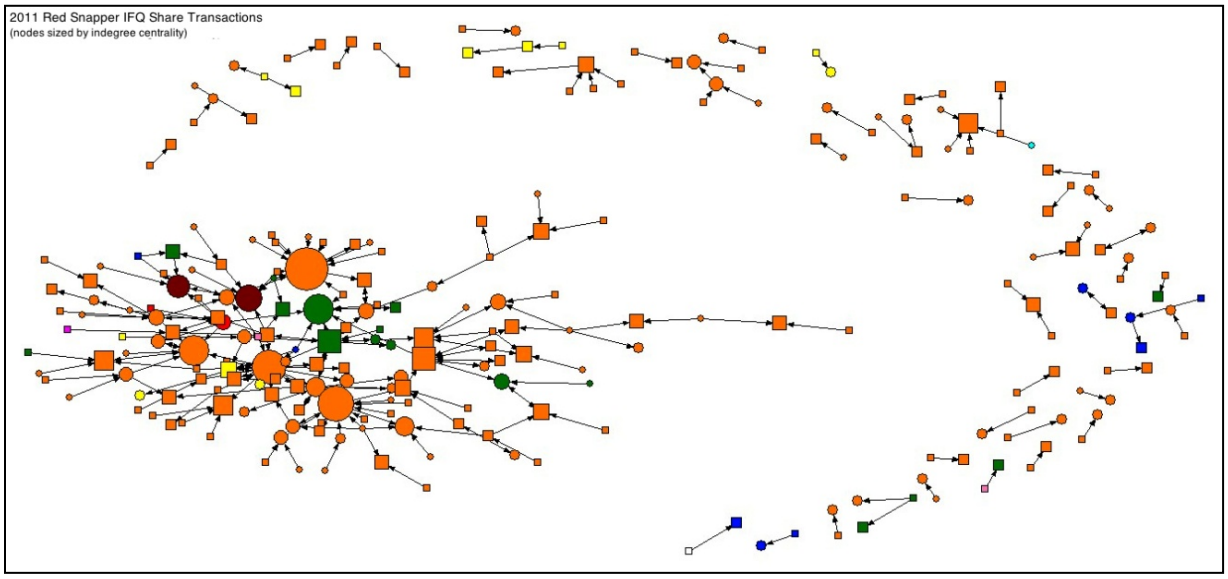

Figure 25. Red snapper share transactions by degree centrality for the 2011 fishing year

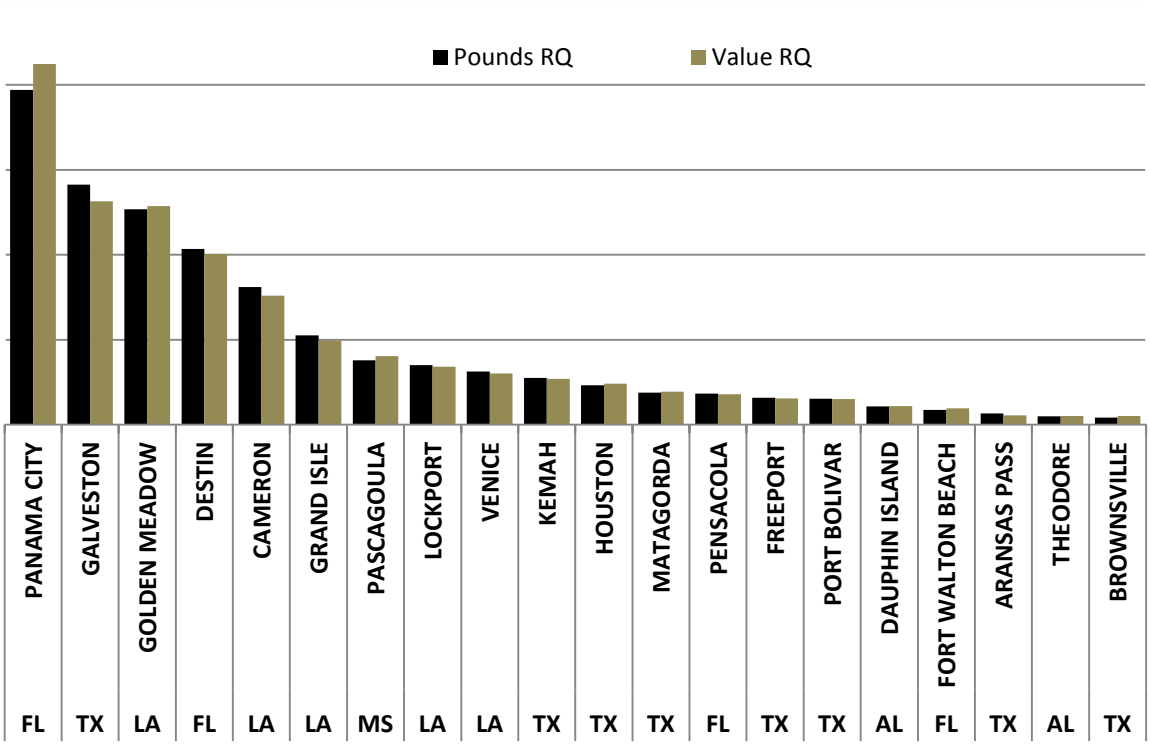

Figure 26. Top 20 red snapper fishing communities by regional quotient (RQ) for 2000

Source: SEFSC accumulated landings system (2012)

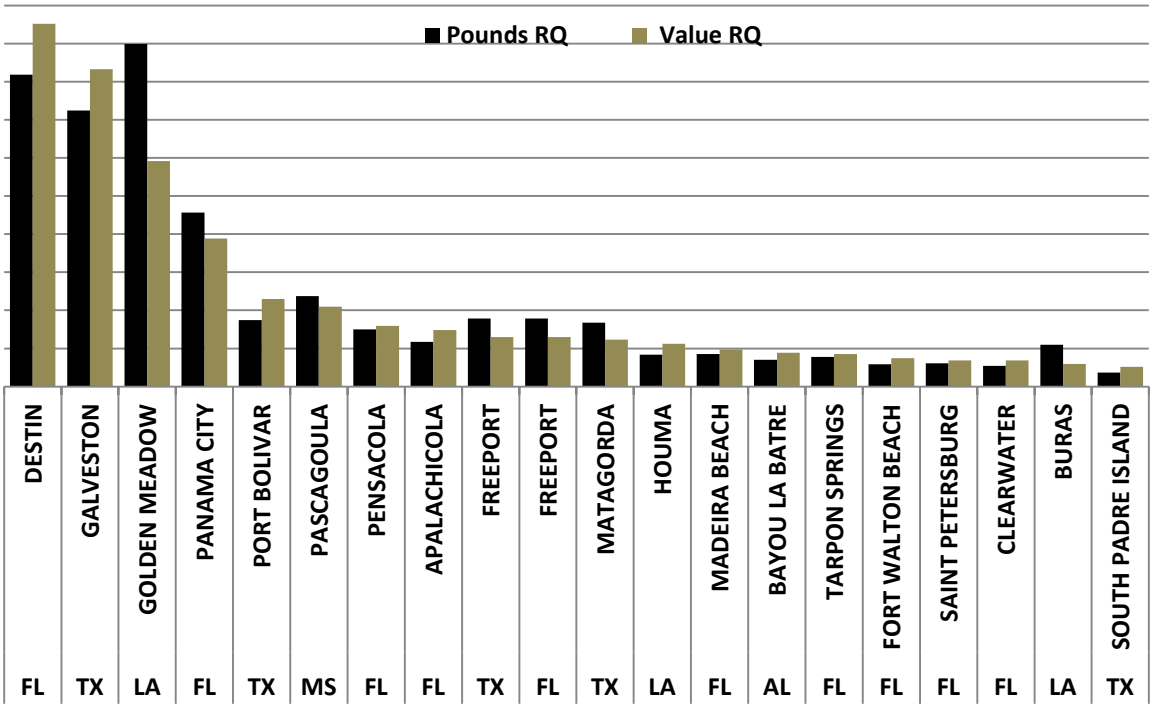

Figure 27. Top 20 red snapper fishing communities by regional quotient (RQ) for 2011

Source: SEFSC accumulated landings system (2012)

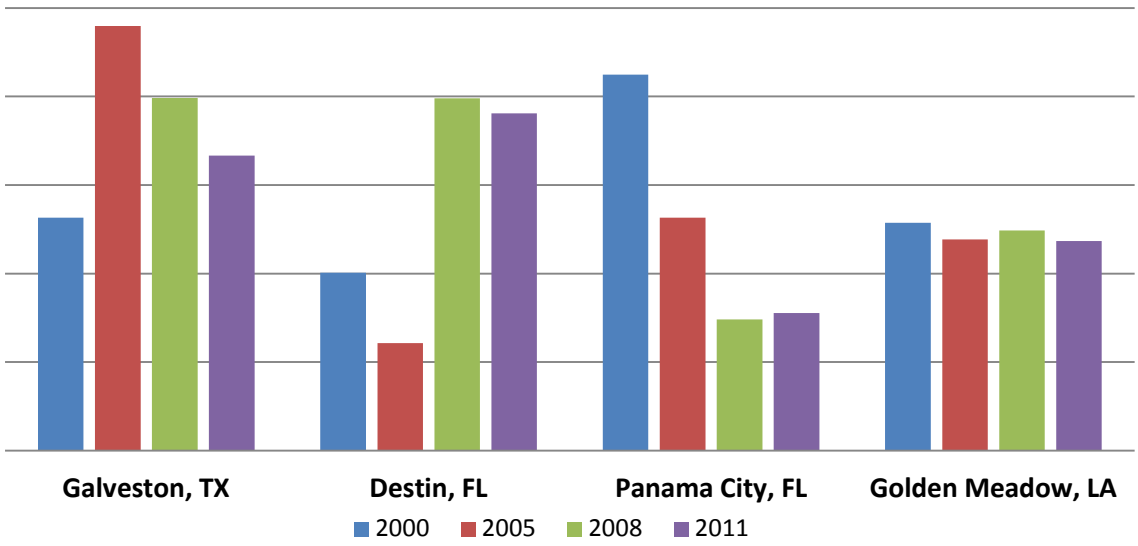

Figure 28. Top 4 red snapper fishing communities by RQ value

Source: SEFSC accumulated landings system (2012)

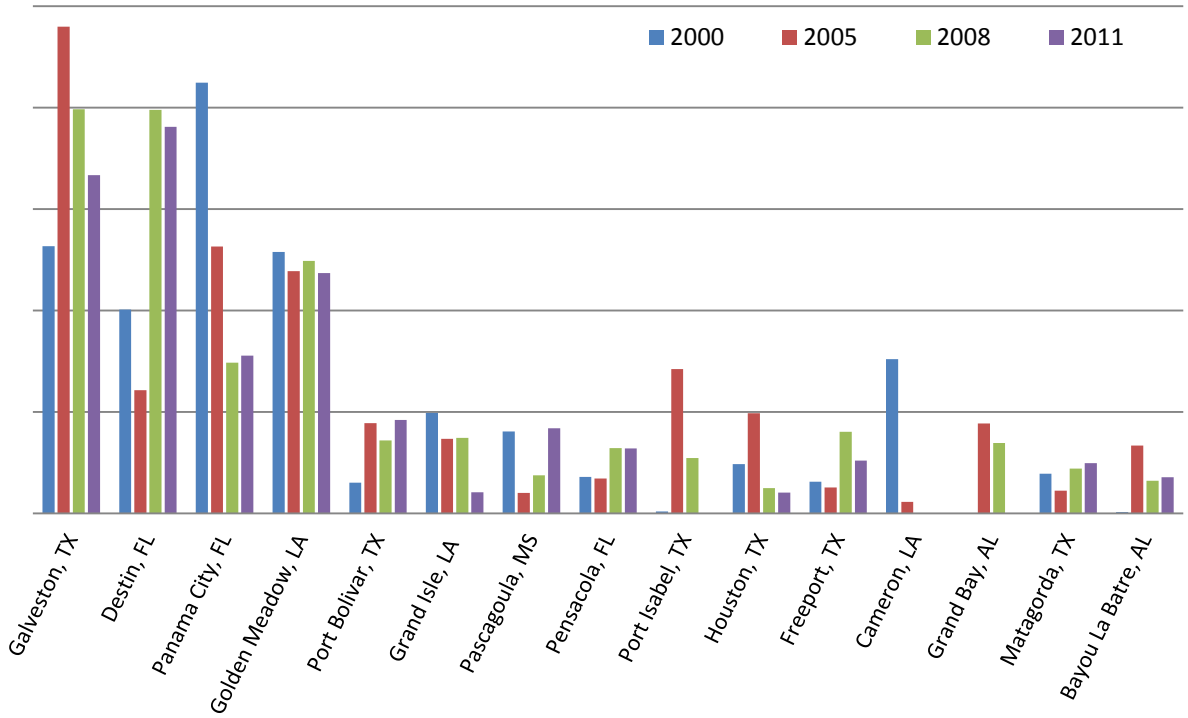

Figure 29. Top 15 red snapper fishing communities by RQ value.

Source: SEFSC accumulated landings system (2012)

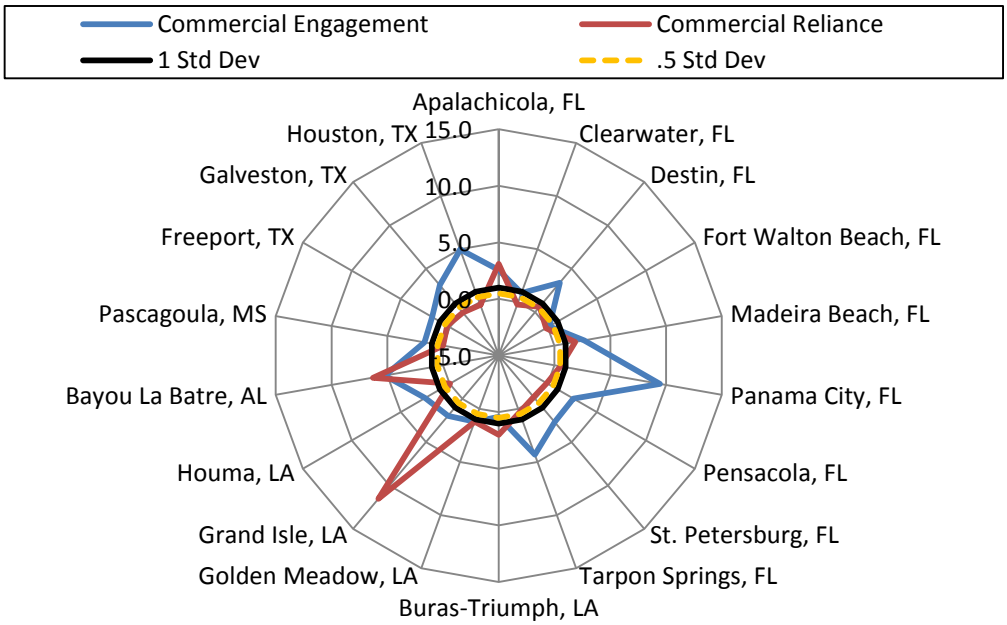

Figure 30. Top 18 red snapper fishing communities' commercial engagement and reliance

Source: SERO Social indicators database (2012)

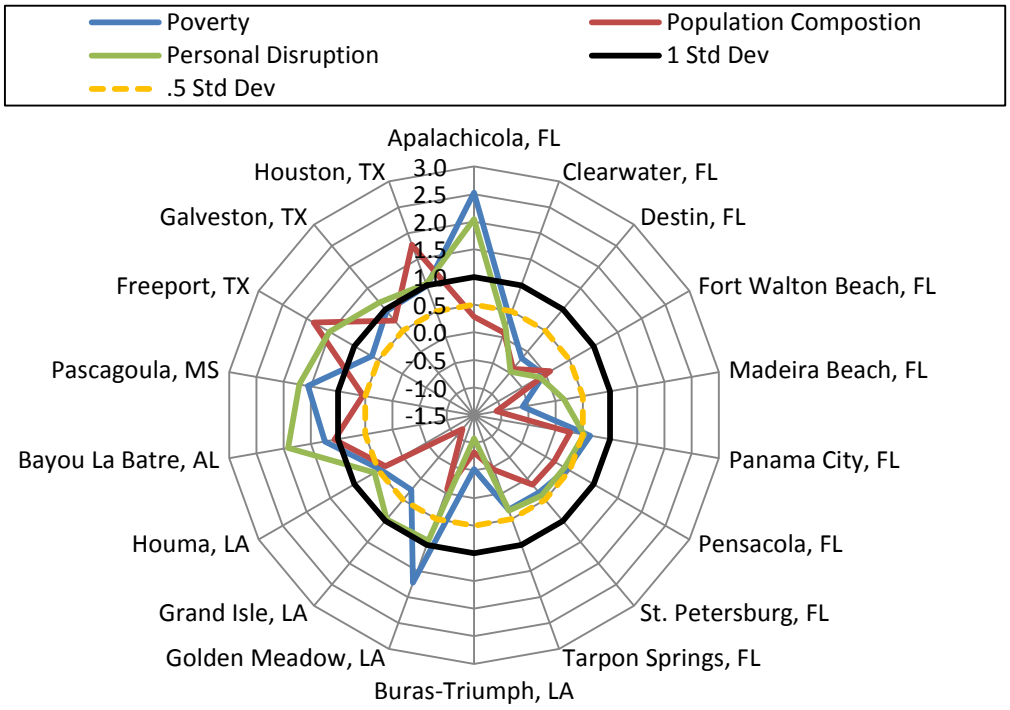

Figure 31. Social vulnerability indices for red snapper fishing communities

Source: SERO Social indicators database (2012)

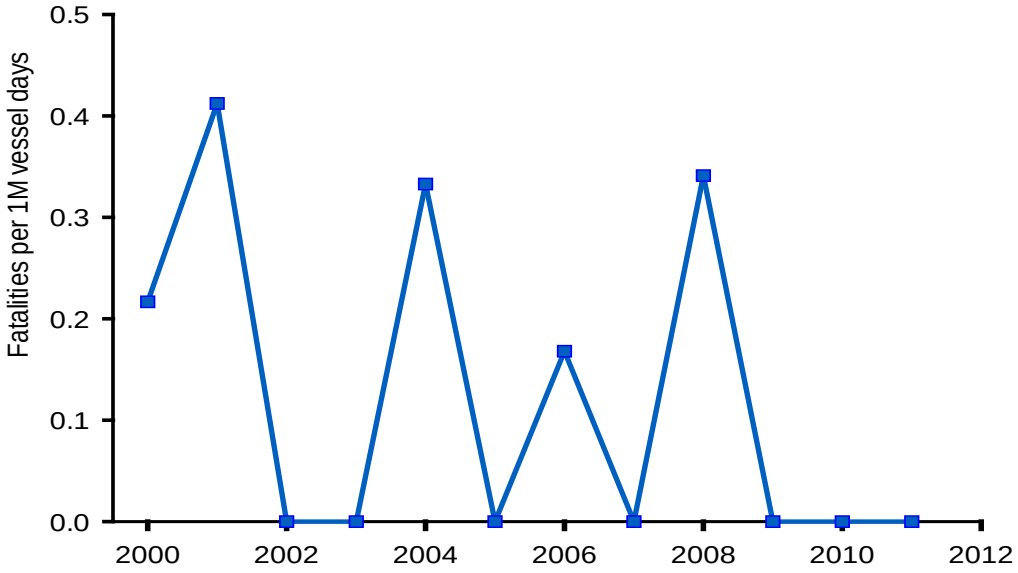

Figure 32. Fatalities at sea for vessels fishing for reef fish in Gulf

Source: National Institute for Occupational Safety and Health (2012).

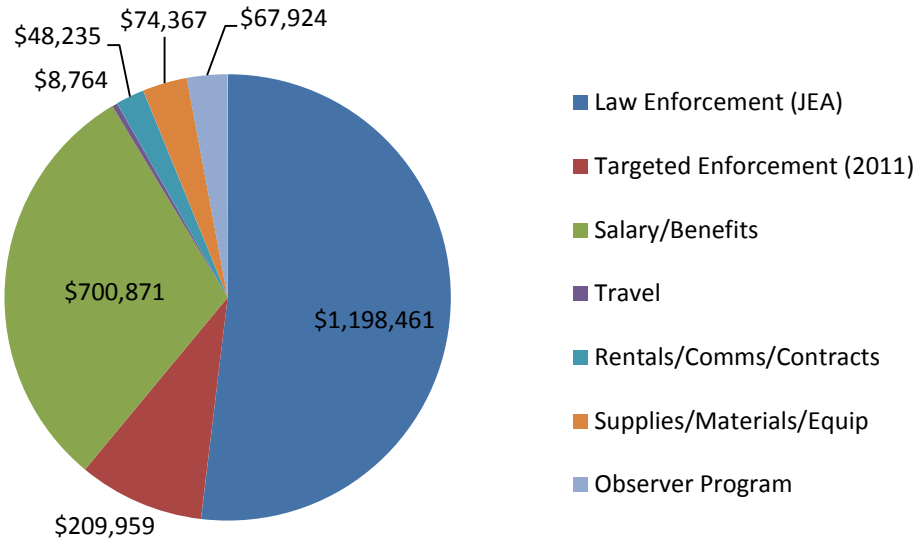

Figure 33. Aggregated RS-IFQ program expenses, 2007-2011

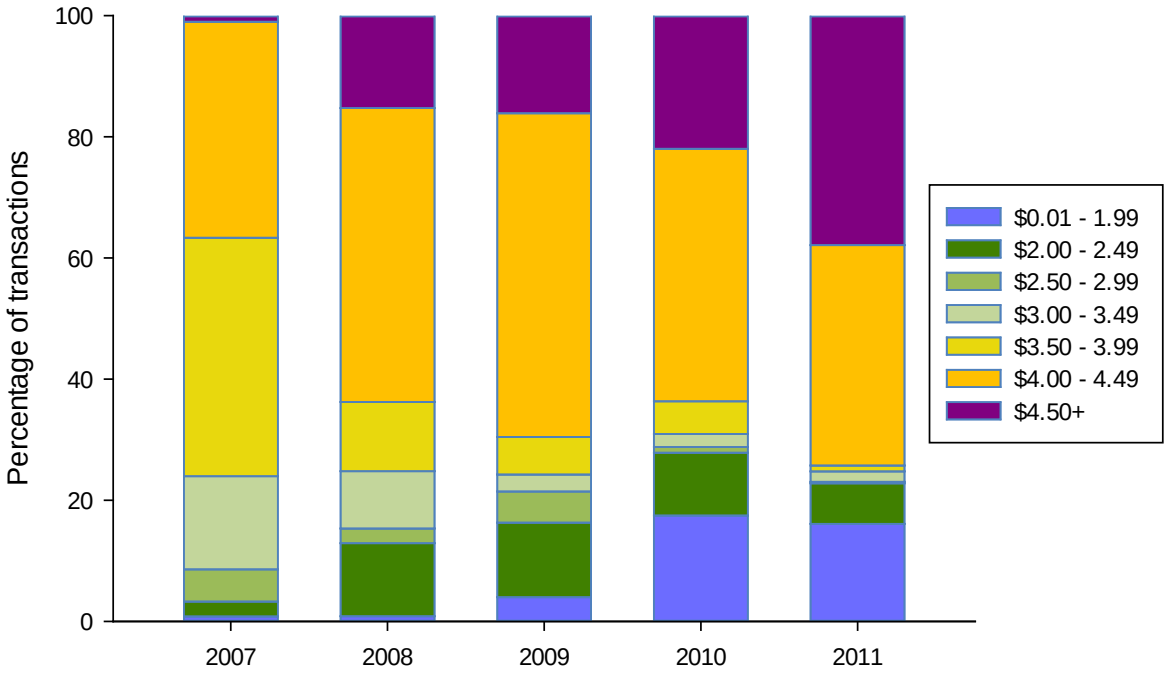

Figure 34. Percentage of landing transactions by various ex-vessel prices by year

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